



SITE MANAGEMENT PLAN for NAVAL AIR STATION JOINT RESERVE BASE (NAS JRB) WILLOW GROVE PENNSYLVANIA



**Engineering Field Activity Northeast
Naval Facilities Engineering Command**

Contract No. N62472-03-D-0057

Contract Task Order 003

December 2004



TETRA TECHNUS, INC.

**SITE MANAGEMENT PLAN
FOR
NAVAL AIR STATION JOINT RESERVE BASE (NAS JRB)
WILLOW GROVE, PENNSYLVANIA**

**COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION - NAVY (CLEAN) PROGRAM**

**Submitted to:
Engineering Field Activity Northeast
Environmental Branch, Code EV2
Naval Facilities Engineering Command
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1.0 INTRODUCTION

This report presents the Site Management Plan (SMP) for Naval Air Station Joint Reserve Base (NAS JRB), Willow Grove, Pennsylvania. The SMP is the management tool for planning, reviewing, and setting priorities for all remedial response activities to be performed at the facility. This SMP presents the sequence of future investigation and remediation activities, the rationale for the prioritization of investigation and remediation events, and an estimated schedule for the completion of these activities. The SMP allows for adjustments to scheduled activities to account for potential impacts created by federal budget constraints, changes in the scope of investigation or remediation activities, or other unanticipated events. A Federal Facilities Agreement (FFA) was negotiated in November 2004. The FFA ensures that environmental impacts associated with the sites are fully investigated and proper response actions are taken. The FFA also outlines the timeline for the response activities. Requirements of the FFA are incorporated into this SMP.

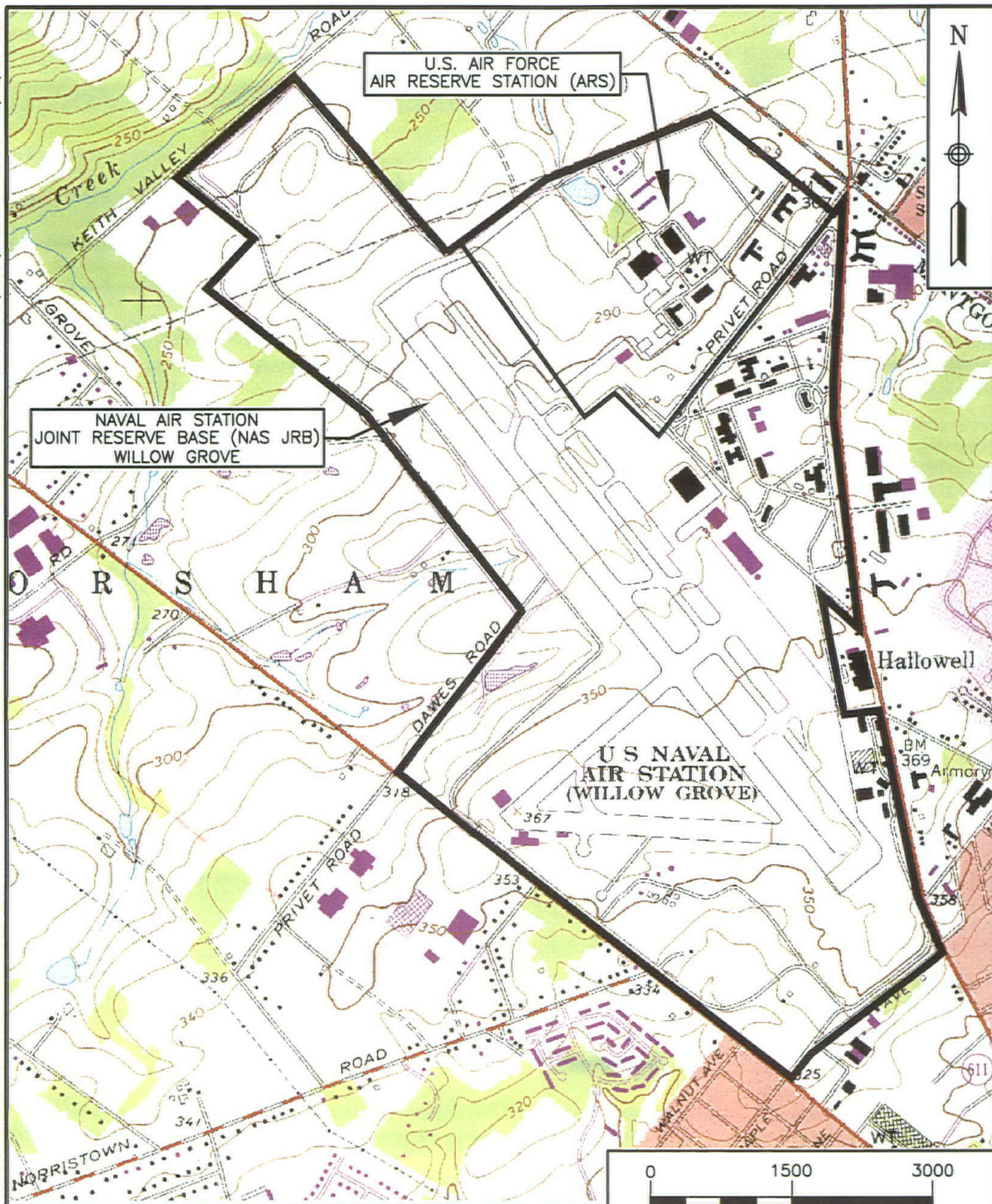
1.1 FACILITY DESCRIPTION

NAS JRB Willow Grove is located in Horsham Township, Montgomery County in southeastern Pennsylvania, approximately 20 miles north of the city of Philadelphia (see Figure 1-1). NAS JRB Willow Grove occupies approximately 1,000 acres of 1,200 acres the Department of Defense (DoD) maintains at the Air Station. The Willow Grove Air Reserve Station (ARS) occupies approximately 200 acres of land in the northeastern section of the Air Station and shares common facilities with the NAS JRB. Figure 1-1 shows the location of NAS JRB Willow Grove and ARS. The Air Station is comprised of flat to slightly rolling terrain and is generally bounded by State Route 611 to the east, State Route 463 to the southwest, and Keith Valley Road to the north.

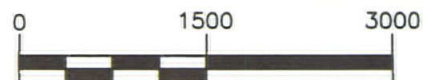
The primary mission of NAS JRB Willow Grove is to provide support for operations involving aviation training activities and to train Navy reservists. NAS JRB Willow Grove supports DoD tenants such as the Marine Reserve, Pennsylvania National Guard and the Army Reserve, and shares facilities/services with the Air Force Reserve. The base provides facilities, services, materials, and training in direct support of all assigned units. These units include an anti-submarine warfare squadron, a helicopter squadron, fleet logistic support squadrons, and other DoD units.

1.2 ENVIRONMENTAL STATUS AND PREVIOUS INVESTIGATIONS


NAS JRB Willow Grove is being investigated through the Department of Defense's Installation Restoration Program (IRP). Each of the sites is in a different stage of the multi-step process toward final disposition within the IRP process the Navy is pursuing jointly with state and federal regulatory agencies.



BASE MAP IS A PORTION OF THE AMBLER, PA U.S.G.S. 7.5 MINUTE QUADRANGLE MAP, DATED 1963, PHOTOREVISED IN 1983.



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DRAWN BY MKB	DATE 10/08/04	 Tetra Tech NUS, Inc. FACILITY LOCATION MAP NAS JRB WILLOW GROVE WILLOW GROVE, PENNSYLVANIA	CONTRACT NO.: 2192	OWNER NO.: CTO 003
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In 1986, the Department of Navy initiated an Initial Assessment Study (IAS) conducted by Rogers, Golden, and Halpern. The IAS was to assess sites posing potential threats to human health or the environment resulting from hazardous materials handling at the facility. Historical records and aerial photographs were reviewed, interviews with site personnel were conducted, and field inspections were performed. Based on this information, nine potentially contaminated sites were identified. Each of these sites was evaluated for potential health or environmental impacts by evaluating the characteristics of potential contaminants and the migration pathways and potential receptors for these contaminants. The study concluded that five sites (Sites 1, 2, 3, 4, and 5) should be subject to a confirmation study.

The 1988 confirmation study included site inspections at 10 sites (the 9 sites identified in the IAS and the Navy Fuel Farm). These investigations included electromagnetic (EM) terrain conductivity surveys and soil vapor surveys, both performed in 1988. These surveys indicated that the EM anomalies (related to fill areas) correlated to the areas of elevated soil vapor readings attributable to tetrachloroethylene (PCE) at Site 3.

In 1989, additional field activities included the installation of monitoring wells at eight different sites and measurement of water levels from the wells to determine groundwater flow direction. Three rounds of groundwater sampling were conducted. Test borings in areas of soil vapor or EM anomalies were performed, and samples were obtained. Surface soil samples were also collected at two sites. To evaluate potential surface water impacts, aqueous and sediment samples were obtained along the surface water migration pathway at one off-site and 11 on-site locations.

In 1990, results were presented in the Site Inspection Studies Report (EA Engineering, 1990) and the Plan of Action for Extended Site Inspections and Remedial Investigations (EA Engineering, 1991). Recommendations were no further action at Sites 4, 6, 8, and 9 and the performance of an Remedial Investigation (RI) at Sites 1, 2, 3, and 5 and the Fuel Farm (Site 10). In addition, an Extended Site Inspection (ESI) was recommended for Site 7. The installation formed a technical review committee.

The ESI field work was conducted at Site 7 in 1991. The fieldwork involved the installation of an additional monitoring well, sampling test borings in the area of soil vapor readings from the 1988 Site Investigation (SI), and collection of surface soil samples to determine if the source of contamination was from upgradient, off-site sources. Results indicated no apparent threat to health or the environment, and no further action was recommended (EA Engineering, 1992).

In 1992, two 210,000-gallon Underground Storage Tanks (USTs) were removed from Site 10. During the construction of sewer lines and culverts near the aircraft parking apron, construction crews reported volatile odors. Samples analyzed for total petroleum hydrocarbons (TPH) and benzene, toluene,

ethylbenzene, and xylene (BTEX) revealed the presence of these contaminants. This site was added as Site 11 (Brown & Root Environmental, 1996).

In 1993, an RI for Sites 1, 2, 3, and 5 recommended a Phase II RI and feasibility study (FS).

In FY95, a Phase II RI workplan was issued for Sites 1,2,3 and 5. Also, the installation established a Restoration Advisory Board (RAB), which meets regularly.

In FY96, the Final Study Report for Product Recovery Pilot System at Site 10 was completed.

In 1997, the RI fieldwork was conducted at Sites 1, 2, 3, and 5. The Site 10 Fuel Farm was not included in the scope of work of the RI. As part of RI activities, B&R Environmental installed monitoring wells, completed test borings and hand auger sampling locations, excavated test pits, and collected surface, subsurface, groundwater, surface water, and sediment samples. The RI concluded that additional sampling was needed at all four sites to further delineate the extent of contamination and/or the sources at the sites (Halliburton NUS, 1993). Also, a draft site management plan and a community relation plan were developed.

In FY98, a draft Phase II RI report for Sites 1,2, 3, and 5 was submitted to regulators for review.

In FY99, the Navy decided to break up the installation restoration sites and submit four separate Phase II RI documents. An interim remedial action (IRA) for polychlorinated biphenyl (PCB)-contaminated soil at Site 1 was completed. Approximately 1,100 tons of soil was removed.

In FY00, a basewide water-level study was completed. The Navy completed pump replacement on two production wells that are in the vicinity of Site 1 and supplied potable and emergency water to the Willow Grove facility. This project also allowed the Navy to obtain valuable analytical data for Site 1 groundwater, as requested by EPA. Additional fieldwork was completed at Site 5.

In FY01, the Navy discontinued active operation of the light non-aqueous phase liquids (LNAPL) recovery system at Site 10. Quarterly bailing or recovery of product continued until 2002.

In FY02, the installation finalized the FS report for Site 5 and submitted it to regulators and the RAB. The final RI report for Site 5, completed in February 2002, documented halogenated VOC contaminants in groundwater and a range of organic compounds (mainly polynuclear aromatic hydrocarbons (PAHs) in limited site surface soils. The RI report for Site 1 was finalized and submitted to the regulators and the RAB. A draft (Navy internal) Site 2 RI report was completed in 2002. At about that time, the Navy

discovered discarded empty drums near Site 2. The Navy contracted with RMC Environmental (RMC) to remove the drums, obtain samples of the drum/contents (residues only) and soils that potentially could have been impacted.

In FY03, the installation completed fieldwork at IR Site 10, the Navy Fuel Farm. In addition, when field conditions improved, RMC, Incorporated (SB EMAC) removed drums and sampled beneath the drums at the EPIC anomalies at Site 2. The Navy intends to combine the results and conclusions of the drum removal and confirmatory sampling into the final RI report for Site 2. In January 2003, quarterly bailing or recovery of product was discontinued at Site 10. PADEP agreed that no further work was necessary at site 10.

In June 2004, the Navy completed a draft Proposed Remedial Action Plan (PRAP) for Site 1 soil. The PRAP was presented in a public meeting in October 2004. Site 2 information from the RMC Report was sent to the Navy's contractor TtNUS for tabulation, evaluation, and incorporation into a Final RI Report for Site 2. PADEP determined that No Further Action at This Time for Site 10 soils was appropriate.

1.3 REPORT ORGANIZATION

The remainder of this report contains five sections. Section 2.0 presents a summary of the procedures to be followed as part of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process. Section 3.0 presents a description of each of the sites included in this SMP (Sites 1 through 9, Fuel Farm (Site 10), and suspected "site" 11). Section 4.0 provides the ranking system used to prioritize the sites at the facility. This is a risk-based model with the worst sites receiving the highest ranking. Section 5.0 presents the schedule for planned CERCLA activities and the assumptions used to develop the schedule. Section 6.0 provides the references used in this SMP.

2.0 CERCLA PROCESS ACTIVITIES

Guidelines established by the United States Environmental Protection Agency (EPA) for the CERCLA process will continue to be followed for the sites at NAS JRB Willow Grove. The CERCLA process provides guidelines for investigation activities prior to the RI, including preliminary assessments (PAs) (completed at NAS JRB Willow Grove; IAS, 1986) and site inspections (SIs) (completed at NAS JRB Willow Grove Sites 1 through 10; EA Engineering, 1990, and suspected "site" 11; Department of Defense, 1996). Because PA and SI activities for the sites addressed under this SMP have been completed, discussions of the CERCLA process activities for PAs and SIs are not included in this section. This section discusses the CERCLA processes required to complete investigative and remediation activities at the facility.

After the site inspection and risk screening process is conducted, if a site is deemed to present a potential risk to human health and/or the environment, the site is subject to the full remedial investigation/feasibility study (RI/FS) process. Depending on the severity of site conditions, a removal action or interim remedial action may be appropriate to mitigate immediate threats to human health or the environment. Potentially applicable CERCLA processes for the NAS JRB Willow Grove sites are described in the following sections.

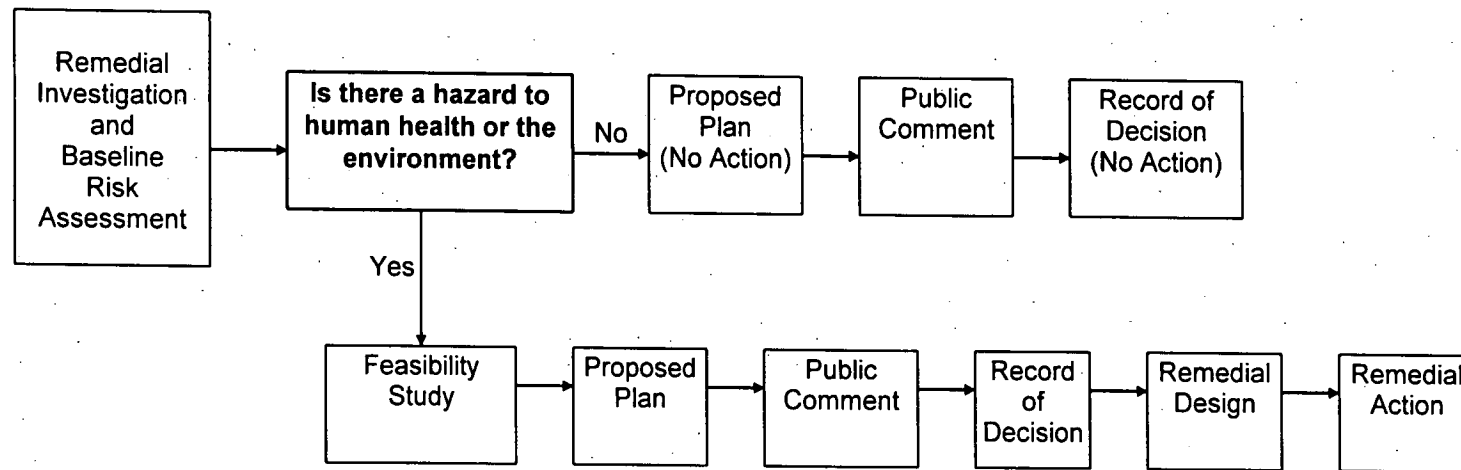
2.1 IAS/SI PROCESS

The IAS is a preliminary investigation usually consisting of review of available data and information on a site, interviews, and a non-sampling site visit to observe areas of potential waste disposal and migration pathways. The SI is a sampling investigation with the goal of identifying potential sources of contamination, types of contaminants, and potential migration of contaminants. The SI is conducted prior to the RI.

2.2 RI/FS PROCESS

Figure 2-1 presents a schematic of the RI/FS process. The RI is a field investigation, more extensive than a SI, with the goal of determining the nature and extent of contamination at the site. The baseline risk assessment, performed as part of the RI, is an analysis of potential adverse health and/or ecological effects arising from site conditions in the absence of any mitigating actions. The FS presents options for cleanup by screening alternatives for remediation and conducting an analysis of the alternatives. Factors for evaluation include overall protection of health and the environment, short- and long-term effectiveness, and cost. The Proposed Remedial Action Plan (PRAP) presents the proposed alternative for remediation of the site.

Figure 2-1
RI/FS PROCESS



selected by the FS. The Record of Decision (ROD), when signed by the Navy and EPA, presents the remedy selected after consideration of the public comments. The remedial design (RD) is the development of the actual design of the selected remedy including the preparation of technical specifications and drawings. The remedial action (RA) is the construction, operation, and implementation of the selected remedy.

2.3 REMOVAL ACTIONS

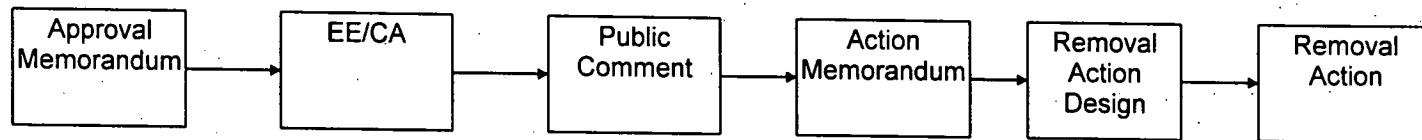
Removal actions are implemented to clean up or remove hazardous substances from the environment or mitigate, minimize, or prevent damage to human health or the environment from a release or threat of release by limiting exposure to those substances. Removal actions may be either time-critical or non-time-critical. Time-critical removal actions are taken when there is an imminent threat to human health and/or the environment. An example of such a threat would be corroded drums that are leaking hazardous substances that would threaten environmental or human health receptors. Non-time-critical removals are actions that may be delayed for six or more months without immediate risk to human health or the environment. Although removal actions often begin prior to the completion of RI/FS activities to reduce the spread of contaminants, they may occur at any point during the RI/FS process.

If a non-time-critical removal action is implemented, an Engineering Evaluation/Cost Analysis (EE/CA) is prepared rather than an FS. The EE/CA is prepared for the substances to be removed rather than on all potentially contaminated media. Media not addressed in the EE/CA will still be considered in the RI/FS process. Figure 2-2 presents the general process for non-time-critical removals.

Removal actions generally are smaller in scope than a typical site RI/FS; therefore, the time required to perform a removal action, including preparation of an EE/CA and removal design and implement the removal action, is usually significantly less than the time needed to complete an RI/FS. Under a removal action, there is still evaluation of options and an opportunity for public comment, and the selected removal action is documented in a Removal Action Memorandum.

If the risk assessment results from the RI/FS process indicate that no further remedial action is required for the entire site after a removal action is completed, the removal action may become the final remedial action. In that case, a no-further-action ROD would be prepared for signature by the concerned parties.

Figure 2-2
NON-TIME-CRITICAL REMOVAL ACTION PROCESS



2.4 INTERIM REMEDIAL ACTIONS

Interim remedial actions are designed to temporarily mitigate potential risks posed by site contaminants to human health and/or the environment until a final remedial action is implemented. Interim remedial activities usually occur prior to initiation of a full FS. Interim remedial actions, if implemented early in the CERCLA process, often reduce long-term remedial action (RA) costs by limiting the extent of contamination at a site. For example, installation of a groundwater pump and treat system to control plume migration would be considered an interim remedial action, if initiated prior to selection of the final remedy. Interim remedial actions are limited in scope and should address only areas or media for which a remedy will be developed during the RI/FS process.

Figure 2-3 shows the interim remedial action process. Because these actions are usually taken prior to completion of the full FS, a focused feasibility study is prepared addressing only the media and contaminants subject to the interim remedial action. Results of the FS are incorporated into a PRAP for the interim remedy that is subject to public comment. Similar to the full RI/FS process, after the public comment period, an interim ROD is prepared and signed, the interim remedial design is developed, and the interim action implemented. If the risk assessment results from the RI/FS process indicate that no further remedial action is required for the entire site after an interim remedial action is completed, the interim action may become the final remedial action for the site.

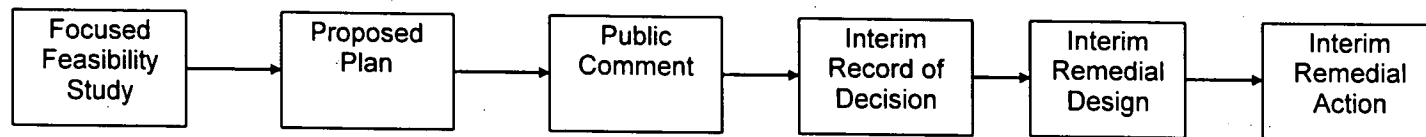
2.5 TREATABILITY STUDIES

Before a ROD is signed, and possibly even before final FS development, laboratory-based or pilot treatability studies may be required. These studies evaluate the effectiveness of a potential remedial technology's performance. The goal of performing treatability studies is for support of the remedial design process. Treatability studies are typically performed when insufficient data are available from the RI to support full-scale design and implementation of the preferred alternative.

2.6 ROD AND POST ROD ACTIVITIES

The ROD is a legal document that describes the remedy selected for a Superfund facility, why the selected remedial actions were chosen and other candidate actions were not, how much the remedial actions are expected to cost, and how the public responded to the Proposed Alternative (combination of technologies proposed for site remediation).

Figure 2-3
INTERIM REMEDIAL ACTION PROCESS



3.0 SITE DESCRIPTIONS AND INVESTIGATIONS

3.1 SITE DESCRIPTIONS

This section presents a history of disposal practices and current status of each of the 11 sites addressed in this SMP. This information is based on data from previous investigations and progress made to date in the Navy's IR program. Site locations are identified on Figure 3-1.

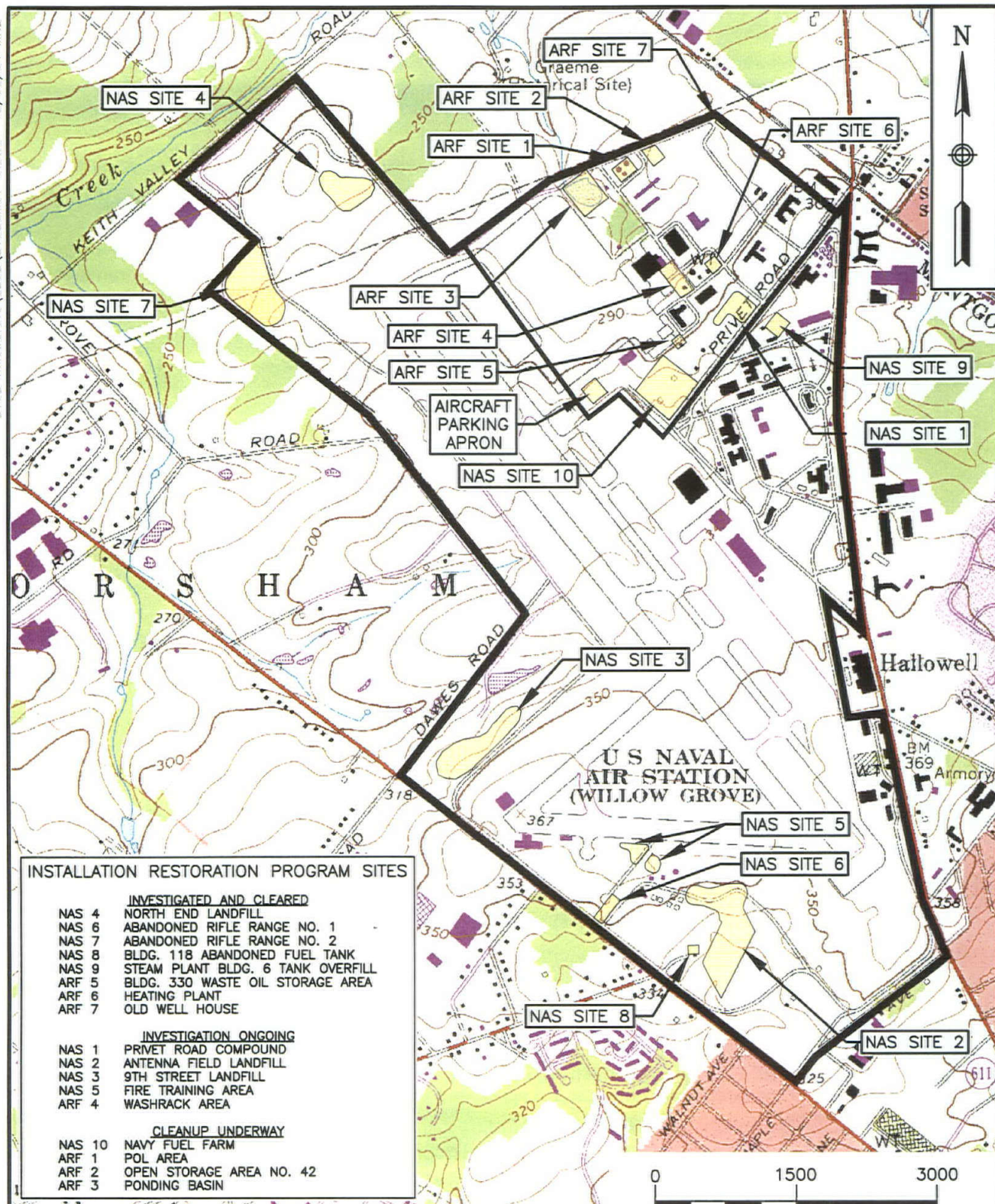
3.1.1 Site 1 - Privet Road Compound Site

The Privet Road Compound is located west of Privet Road, across from the steam plant (Building No. 6). The entire site area is approximately 2 acres and consists of a bowling alley, parking lot, and a 1/2-acre fenced area. Trash handling operations at the Privet Road Compound began in 1967 when the Ninth Street Landfill (Site 3) was closed. To replace the landfill, regular trash pickup and off-site disposal were initiated. The Privet Road Compound site was used to process wastes from 1967 to 1975. A fence was erected around the compound area in 1972 to control waste disposal and handling within the compound. The suspected waste handling area, however, is believed to extend throughout Site 1, including the area where the bowling alley and parking lot are now located.

The Privet Road Compound was constructed as a transfer station to handle materials not accepted by the trash pickup service. During operations at the compound, wastes were temporarily stored on site to await off-site disposal or burned and/or buried on site. Burning and burial ceased by 1975; however, stored waste material was not completely removed from the site until 1977 (Rogers, Golden, and Halpern, 1986).

Wastes reportedly disposed at the site included paint wastes, paint stripper and solvents, Freon, general refuse, asbestos, battery acid, sewage sludge containing heavy metals, oils and lubricants, and mercury-containing dental amalgam. Transformers (containing polychlorinated biphenyls (PCBs)) were also stored at the site. PCB-containing liquids were spilled when stored transformers were overturned during a burglary at the compound (Rogers, Golden, and Halpern, 1986).

B&R Environmental (formerly Halliburton NUS Corporation) conducted RI field activities at Site 1 in 1991. The RI concluded that additional sampling was needed to further delineate the extent of contamination and/or potential sources at the site. The RI recommended a Phase II RI and a feasibility study (FS) (Halliburton NUS, 1993).



BASE MAP IS A PORTION OF THE AMBLER, PA U.S.G.S. 7.5 MINUTE QUADRANGLE MAP, DATED 1963, PHOTOREVISED IN 1983.

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**SITE LOCATION MAP
NAS JRB WILLOW GROVE
WILLOW GROVE, PENNSYLVANIA**

In 1997, the Phase II RI fieldwork was conducted and in 1998, a draft Phase II RI report was submitted to regulators for review (Brown & Root, 1998).

In 1999, the Navy decided to de-link the reporting process for the installation restoration (IR) sites (1, 2, 3, and 5) and submit four separate Phase II RI documents. Also in 1999, an interim removal action (IRA) for PCB-contaminated soil at Site 1 was completed in June. A total of approximately 1,100 tons of soil was removed for disposal off-site.

In 2000, base wide water-level studies were completed in cooperation with local municipal authorities and the United States Geological Survey (USGS). The Navy contracted TtNUS, to procure new water well pumps, motors and associated piping and control systems (including installation services) to replace the two Navy water supply production well pumping systems originally installed in the 1940's. Replacement of these aged pumping systems was a compromise that resulted in IR program access to the two deep Navy production well boreholes (NW-1 and NW-2) for geophysical, groundwater quality, and production rate studies performed by the USGS. These two wells are the sole supply of potable and emergency (fire fighting) water for the entire Willow Grove Air Station facility. This project allowed the Navy to obtain the Navy supply well water quality analytical data requested by EPA to help analyze Site 1 groundwater conditions.

In 2002, the RI report was finalized and submitted to the regulators and the RAB (TtNUS, 2002).

In 2004, a draft Addendum RI Report was submitted. The draft Addendum RI Report determined that the chlorinated solvents found in the local groundwater do not originate substantially from the Privet Road Compound area, but appear to be from an off-Base location southeast of Site 1 across Pennsylvania Route 611 in the vicinity of the former Kellet Aircraft manufacturing facility.

In September 2004, the Navy submitted the final Proposed Remedial Action Plan (PRAP) for Site 1 soil (TtNUS, September 2004). A public meeting was held to present the Navy's plan for no further action for Site 1 soil, based on the PCB-contaminated soil removal. A public comment period was set for September 27, through October 27, 2004 to encourage public participation in the decision process for the Privet Road Compound.

3.1.2 Site 2 - Antenna Field Landfill

The Antenna Field Landfill is located in the southern portion of the Naval Air Station, southwest of Runway 10/28 (Figure 3-1). The landfill has been estimated to be approximately 9 acres in size.

The landfill was used between 1948 and 1960 as the principal disposal area for solid waste generated by the facility. Landfill activities consisted of trench excavation with subsequent burning and burial of waste material disposed within the trenches.

Waste disposal activities included the excavation of trenches where wastes were subsequently burned and/or buried. In addition to general wastes, bulk items such as furniture, tires, and shingles were disposed. Paint wastes and sewage sludge were also reportedly disposed (Rogers, Golden, and Halpern, 1986).

In the late 1990's, an antenna array consisting of five antennae was constructed on the site.

B&R Environmental conducted RI field activities at Site 2 in 1991. The RI concluded that additional sampling was needed to further delineate the extent of contamination and/or the sources at the site. The RI recommended a Phase II RI and a FS (Halliburton NUS, 1993).

In 1997, the Phase II RI fieldwork was conducted and in 1998, a draft Phase II RI report was submitted to regulators for review (Brown & Root, 1998). In 1999, the Navy decided to de-link the reporting process for IR sites (1, 2, 3, and 5) and submit four separate Phase II RI documents.

A draft (Navy internal) Site 2 RI report was completed in 2002 (TtNUS, 2002). At about that time, the Navy discovered discarded empty drums near Site 2. The Navy contracted with RMC Environmental (RMC) to remove the drums, obtain samples of the drum/contents (residues only) and soils that potentially could have been impacted. When field conditions were appropriate, RMC removed drums and sampled beneath the drums at the EPIC anomalies (RMC, 2003). Information from the Site 2 RMC Report was sent to the Navy's contractor TtNUS for tabulation, evaluation, and incorporation into a Final RI Report for Site 2. TtNUS combined the results and conclusions of the drum removal and confirmatory sampling into the revised draft Site 2 RI report (Navy internal review - 10/06/04).

3.1.3 Site 3 - Ninth Street Landfill

The Ninth Street Landfill site is located at the western boundary of the facility, immediately north of Ninth Street. Disposal operations at the 9-acre site were initiated as a replacement for the Antenna Field Landfill in 1960. Wastes were disposed by burning and burial in excavated trenches. Wastes were similar to those at Site 2 and include general wastes, bulk items, paint waste, asbestos, and sewage sludge (Rogers, Golden, and Halpern, 1986). Transformers containing PCBs were also stored and serviced in a salvage yard established on the landfill after the landfill's closure in 1967 (EA Engineering, 1990).

B&R Environmental conducted RI field activities at Site 3 in 1991. The RI concluded that additional sampling was needed to further delineate the extent of contamination and/or the sources at the site. The RI recommended a Phase II RI and a FS (Halliburton NUS, 1993).

In 1997, the Phase II RI fieldwork was conducted and in 1998, a draft Phase II RI report was submitted to regulators for review (Brown & Root, 1998). In 1999, the Navy decided to de-link the reporting process for the IR sites (1, 2, 3, and 5) and submit four separate Phase II RI documents. In response to comments, the Navy has performed minor investigations at Site 3 since the draft Phase II RI report was submitted to regulators for review in 1998. USGS performed geophysical logging of two irrigation wells owned by the golf course in March 1998. Sediments from the recreational pond (part of the NAS JRB Willow Grove storm water control system) were analyzed in 2002 (Woodward and Curran 20543901, May 2002) and the Navy performed a major pond maintenance construction project to improve pond dam integrity in 2003.

No individual Site 3 RI has been prepared for submission or separate review and Site 3 has not progressed further past Phase II RI investigations due to funding and priority issues as well as a lack of cooperation from the nearby golf course.

3.1.4 Site 4 - North End Landfill

Limited information exists on the operations at the North End Landfill; however, the landfill reportedly was used from approximately 1967 to 1969 to accept overflow wastes from the Privet Road Compound. The site is approximately 3.5 acres located between the northern end of Runway 15/33 and the Perimeter Road. Disposed waste materials are believed to be items not collected during routine trash pickup such as bulk items, sewage sludge, and oils and lubricants. During the site's operation, it is reported that wastes were covered; however, observations from the IAS showed waste materials, including oil, at the surface (Rogers, Golden, and Halpern, 1986).

Based on previous and subsequent investigations (PA, SI, ESI), combined with results of the site screening process, the Navy has recommended that no further remedial action should be required at this site. The Navy has filed for concurrence on this determination with EPA. For purposes of this SMP, it is assumed that this concurrence will be received and additional investigative activities will not be required.

3.1.5 Site 5 - Fire Training Area

The Fire Training Area is located in the south-central portion of NAS JRB, approximately midway between Runway 10/28 and State Route 463 (Figure 3-1). The site is located immediately to the south of Taxiway Juliet and covers an irregularly shaped area of approximately 1.25 acres. The training area was used

from 1942 to 1975 for large-scale firefighting exercises, which included the disposal and burning of flammable liquid wastes generated by the Naval Air Station. Wastes including solvents, paint chemicals, xylenes, toluene, and various petroleum compounds were consumed at the rate of up to 4,000 or more gallons per year in these fire fighting exercises. The area was also reportedly used for the drum storage of these flammable materials during the periods between burning exercises.

The Fire Training Area is primarily covered by grasses, with some woody and brushy vegetation present within the southern portion of the area. The burn area is located in the south-central portion of the site. Two small ponds are immediately south of the former burning area. Additional site information can be found in the RI Report for Site 5 – Fire Training Area (TtNUS, 2002).

B&R Environmental conducted RI field activities at Site 5 in 1991. The RI concluded that additional sampling was needed to further delineate the extent of contamination and/or the sources at the site. The RI recommended a Phase II RI and a FS (Halliburton NUS, 1993).

In 1997 Phase II RI fieldwork was conducted and in 1998, a draft Phase II RI report was submitted to regulators for review (Brown & Root, 1998). In 1999, the Navy decided de-link the reporting process for IR sites (1, 2, 3, and 5) and submit four separate Phase II RI documents.

In 2000 additional field work was completed at Site 5 to verify that site groundwater contamination was not moving off-Base toward the Horsham Township Municipal water supply well number 26 (HTMW 26). Sentinel monitoring wells installed on Navy property to monitor water quality between Site 5 and HTMW 26 are now sampled annually by the Base to verify contamination is not migrating closer toward the municipal water supply well.

The final RI report for Site 5, completed in February 2002 documented halogenated VOC contaminants in groundwater and a range of organic compounds (mainly polynuclear aromatic hydrocarbons (PAHs)) in limited site surface soils (TtNUS, 2002). The final RI Report for Site 5 combined the results from the draft Phase II RI Report and previous findings for Site 5, with the results of activities performed from April 1998 through October 2000 (TtNUS, 2002).

In 2002, TtNUS finalized the FS report and submitted it to regulators and the RAB (TtNUS, 2003). Based on RAB member comments, the Navy decided to reconsider emerging (biological and chemical treatment in-situ) technologies and resubmit the Site 5 groundwater FS for regulatory and public review.

After submission of the RI Report (TtNUS, 2002) and FS Report (TtNUS 2002), the Navy contracted for installation of an additional airport runway perimeter security fence. Part of the new security fencing was

installed in or near the area of known PAH soil contamination. Because of this potential change to Site 5 surface soil conditions in the area of the identified PAH "hot spots," surface and shallow subsurface soil samples were collected in June 2004 for a side-by-side comparison with the 1997 data. A draft Site 5 RI Addendum, which incorporates the new soil data, has been submitted to the EPA and is currently under review (TtNUS, 2004).

Additional groundwater monitoring for contaminant movement was conducted in June 2004. Results have been evaluated (confirming past evaluation and conclusions) and will be included in the Final Groundwater FS for Site 5. The revised draft FS for Site 5 groundwater was submitted to the EPA and PADEP for review (TtNUS, 2004). The overall objective of the revised FS is to develop and evaluate the emerging technology alternatives requested by the RAB that address source control and groundwater remediation for Site 5.

3.1.6 Site 6 - Abandoned Rifle Range No. 1

Abandoned Rifle Range No. 1 is located adjacent to Horsham Road near the southwestern corner of the Marine Compound. The range was built in 1942 and consisted of a firing mat and an earthen rampart. The rampart was approximately 1 acre in size. It appears in an aerial photo from 1958 that the firing berm was most likely used to grade or cap the Antenna Field Landfill. It is not known when the range was closed; however, the second range was not built until 1965, so it is assumed that this site was active until that time. After the site was closed, the rampart was regraded. There are no records indicating if the lead from the fired rounds was removed; therefore, it is assumed that the lead was mixed with the earth from the rampart during the regrading (Rogers, Golden, and Halpern, 1986).

EA Engineering performed ESI fieldwork at Site 7 in 1991. Results indicated no apparent threat to health or the environment, and no further action was recommended (EA Engineering, 1992).

Based on previous investigations (PA, SI, ESI), combined with results of the site screening process, the Navy has recommended that no further remedial action should be required at this site. The Navy has filed for concurrence on this determination with EPA. For purposes of this SMP, it is assumed that this concurrence will be received and additional investigative activities will not be required.

3.1.7 Site 7 - Abandoned Rifle Range No. 2

The site is located in the northwestern corner of the facility, west of the north end of Runway 15/33. Construction and operation of the range were similar to Site 6 and consisted of a 1-acre earthen rampart to collect fired rounds of ammunition. The range operated from 1965 until 1977 when the current range located in Building 176 at the Army Reserve Compound was constructed. The rampart, along with the

spent ammunition, was regraded in 1977. This area was subsequently used as a landfill for inert materials including clean fill, broken concrete, asphalt, and cinderblocks. In addition, dry wastewater treatment sludge and emulsified oil and grease from on-site oil/water separators were reported to have been buried at the site (Rogers, Golden, and Halpern, 1986).

3.1.8 Site 8 - Building 118-Abandoned Fuel Tank

The site consists of an underground 500-gallon heating fuel tank located approximately 50 feet north of Building 118. The tank was placed in service in 1959 and was abandoned in place in 1980 when it was replaced with a 290-gallon above ground tank. The tank contained only No. 2 heating fuel and serviced Building 118. In 1980, oil was observed seeping into the basement of Building 118. This occurred on an intermittent basis and the oil was removed after each occurrence. The tank was investigated as a result of the seepage; the tank was empty and soils in the excavation around the tank did not indicate the presence of released materials; however, the fill and riser pipes were removed and the tank was buried in place (Rogers, Golden, and Halpern, 1986).

Based on previous investigations (PA, SI, ESI), combined with results of the site screening process, the Navy has recommended that no further remedial action should be required at this site. The Navy has filed for concurrence on this determination with EPA. For purposes of this SMP, it is assumed that this concurrence will be received and additional investigative activities will not be required.

3.1.9 Site 9 - Steam Plant Building 6 Tank Overfill

When the main steam plant (Building 6) was converted from coal to oil in 1969-70, spill containment for fuel oil was not constructed. In 1978, a fuel oil supplier delivered No. 2 fuel oil to a filled tank while leaving the delivery truck unattended. The fuel backed up through the vent pipe, and approximately 3,000 to 5,000 gallons of fuel oil were released. The spill was located in the area between Building 6 and Building 114. This area is now bermed to contain spills resulting from fuel delivery.

The NAS JRB Willow Grove fire department responded to the spill event and flushed the fuel with water. Runoff was directed to drainage swales downstream of the steam plant. The spill was directed toward the Air Reserve Facility's detention basin on the northern side of the facility. The basin was equipped with oil spill containment devices. The total affected area was less than 1 acre (Rogers, Golden, and Halpern, 1986).

Based on previous investigations (PA, SI, ESI), combined with results of the site screening process, the Navy has recommended that no further remedial action should be required at this site. The Navy has filed

for concurrence on this determination with EPA. For purposes of this SMP, it is assumed that this concurrence will be received and additional investigative activities will not be required.

3.1.10 Site 10 - Navy Fuel Farm

Site 10 is located south of the Air Reserve facility along the north side of Privet Road. The site formerly had two partially buried, 210,000-gallon fuel tanks (Tank No. 115 and Tank No. 116 containing JP-4/JP-5 aviation fuel). Two smaller underground storage tanks (USTs) were located in the southeastern corner of the site. One tank contained diesel fuel and the other was used for storage of waste oil. The waste oil tank was formerly used for fuel storage. In 1986, Tank No. 115 was overfilled and fuel was released to the ground. The same year during excavation for utility work on the southern side of the site, non-aqueous phase liquid (NAPL) was observed floating on top of the water in the trench. The NAPL was observed in the area of a dry well located near the northeastern corner of Building 81, which is located south of the 210,000-gallon tanks. The dry well was used to discharge effluent water siphoned from the bottom of the fuel tanks (EA Engineering, 1990). In March 1989, JP-5 jet fuel was detected emanating from two patches of dead grass on the west side of Tank No. 115. In 1991 the two main fuel tanks, the waste oil and diesel fuel USTs were removed. Inspection of the waste oil tank during removal revealed that the tank was not intact as holes up to 1 inch in diameter were reported.

In 1995, groundwater remediation pilot systems were being investigated to address the petroleum (jet fuel) contamination at Site 10 (Navy Fuel Farm) under the Pennsylvania Department of Environmental Protection (PADEP) UST program. The Final Study Report for Product Recovery Pilot System was completed in 1996.

In 1998, a light non-aqueous phase liquid (LNAPL) recovery system designed to remediate the jet fuel spill was installed.

In 2001, the Navy discontinued active operation of the LNAPL recovery system for the jet fuel spill. Quarterly floating product recovery by bailing, or capture by absorption onto recovery "socks" down well continued until January 2003.

PADEP approved the final Work Plan for various fieldwork efforts at Site 10 dated March 2003 (EA, 2003).

A final RI for Site 10 soil was submitted in December 2003 to support no further investigation at this time (EA, 2003).

In September 2004, the Navy submitted the Request for No Further Action for IR Program Site 10 Groundwater (EA, September 2004). PADEP agreed with the Navy that no further remedial action or

investigation at this time is appropriate for Site 10 soils or groundwater. However, PADEP noted in their letter dated October 1, 2004 (Appendix B) that groundwater and soil at Site 10 do not meet criteria for unrestricted use and that it may be appropriate to seek full closure under Act 2 if land use changes.

3.1.11 Potential "Site 11" - Aircraft Parking Apron

In 1992, during construction of a storm sewer culvert, organic odors were detected by the construction crew. This area is located at the north end of the main runway, between the Navy and Air Force parking aprons. It is suspected that fuel was spilled in this area in the past (Department of Defense, 1996). Although soil samples were analyzed and the suspected contaminated soil was excavated, confirmation sampling was not conducted in 1992. Also, the analytical method was not stipulated and the laboratory reporting units were questionable (the samples consisted of soil; however, the units indicated aqueous samples). Therefore, PADEP requested that confirmation soil samples be collected and evaluated to determine if attainment for Act 2 liability protection for closure could be demonstrated for the former excavated area (area of concern). In addition, PADEP requested that groundwater be sampled downgradient of the site to determine if the petroleum-contaminated soil had affected the groundwater in the area.

PADEP approved the final Work Plan for various fieldwork efforts at suspected "site" 11 dated March 2003 (EA, 2003).

In March 2004 the Navy submitted the final report of PADEP Act 2 soil sampling and analysis (EA, March, 2004) at suspected Navy "site" 11 (aircraft parking apron). PADEP agreed with the Navy conclusion that this "site" did not meet the criteria necessary to be considered under any program for potential remediation. This "site" has never formally entered either the IR or UST program. It was agreed by PADEP and the Navy that no further action of any kind is required for the suspected "site" 11, former aircraft parking apron.

4.0 SITE RANKING

The site ranking methodology was developed by the DoD to rank Defense Environmental Restoration Program (DERP) sites based on the degree of risk posed to human health and the environment. Results of the ranking are used to prioritize sites and focus investigation and remediation efforts. Sites are categorized into High, Medium and Low relative risk groups to assure that investigations of sites currently impacting human or ecological receptors, or with the potential for significant migration from the site, are conducted before sites posing less significant threats. Guidance for this methodology is presented in the Relative Risk Site Evaluation Primer (Appendix C) (United States Department of Defense, 1996).

4.1 SITE RANKING - QUANTITATIVE ANALYSIS

For quantitative screening analysis, human health risks were evaluated assuming that groundwater was used as tap water (resulting in potential ingestion and inhalation exposures), and exposure to soil was based on a residential model (resulting in potential dermal and ingestion exposures) (EPA, 1994). Surface water was not considered as a potable source of tap water due to dilution factors and the lack of surface water intakes for municipal water systems in the vicinity of NAS JRB Willow Grove. Ecological risk was determined for the surface water pathway only, because benchmark values for terrestrial receptors are not readily available.

To rank the sites, Contaminant Hazard Factors (CHF) for human health (carcinogenic and noncarcinogenic) and ecological risk were calculated. The CHF values for each site were determined by dividing the maximum detected concentration of each individual compound found in each environmental medium (soil, groundwater, surface water and/or sediment) by the corresponding, most recent EPA Preliminary Remediation Goal (PRG), federal Ambient Water Quality Criterion (AWQC), and/or National Oceanographic and Atmospheric Administration (NOAA) sediment screening value. For media containing more than one contaminant, the ratios of the individual contaminants are added (Department of Defense, 1996).

The relative ranking analysis and quantitative scoring for the sites are presented in Appendix D.

4.2 SITE RANKING - QUALITATIVE ANALYSIS

After completion of the quantitative analysis, potential exposure to human or environmental receptors and the potential for contaminants to migrate from the site were evaluated qualitatively. The qualitative analysis consisted of determining use and the potential for exposure of human or ecological receptors to each environmental medium [groundwater (human health), soil (human health and ecological), surface

water (human health and ecological), and sediment (human health and ecological)]. The methodology for determining qualitative risk consisted of selecting the most accurate of three statements for each medium, as discussed below.

4.2.1 Receptor Factor

The Receptor Factor (RF) identifies actual or potentially exposed human or ecological populations for each site. The RF was determined for each environmental medium (where data were collected) for each site. The qualitative factors (questions) are presented by medium below.

4.2.1.1 Groundwater

To determine the human receptors potentially exposed to groundwater at each site, three questions were asked and answered. The statement that best characterized conditions at the site was selected. These statements are as follows:

- a. There is a threatened or potentially threatened water supply downgradient of the site and groundwater (contaminated or not) is currently used as a drinking water source or is equivalent to a Class I or Class IIA aquifer.
- b. There is no potentially threatened groundwater supply well downgradient of the site. The groundwater is potentially usable for drinking water, irrigation, or agriculture but not currently used (Class IIB aquifer).
- c. There is no potentially threatened groundwater supply well downgradient of the site. The groundwater is not considered a potential source for drinking water or is of limited beneficial use (Class IIIA, IIIB, or perched aquifer).

4.2.1.2 Surface Soil

To qualitatively evaluate the potential exposure to human populations from surface soils, the following statements were considered:

- a) There are receptors present (e.g., workers, residents, recreational) that have access to the contaminated soil.
- b) There exists the potential for receptors to have access to the contaminated soil.

- c) There is little or no potential for receptors to have access to the contaminated soil.

4.2.1.3 Surface Water

To qualitatively evaluate the potential exposure to human populations from surface water, the following statements were considered:

- a. There are receptors present (e.g., drinking water, recreational use) that have access to the surface water.
- b. There exists the potential for receptors to have access to the surface water.
- c. There is little or no potential for receptors to have access to the surface water.

To evaluate the potential for impacts on ecological receptors, one of the following statements was selected to best characterize the site:

- a. Evidence exists that wildlife habitat or wetland areas exist in or are proximal to surface water adjacent to or downstream of the site.
- b. The potential exists that wildlife habitat or wetland areas may exist in or be located proximally to surface water adjacent to or downstream of the site.
- c. There is little or no potential for wildlife habitat or wetlands areas to exist in or proximal to surface water adjacent to or downstream of the site.

4.2.1.4 Sediment

To qualitatively evaluate the potential exposure to human populations from surface water sediments, the following statements were considered:

- a. There are receptors present (e.g., potable water intake, recreational use) that have access to the surface water sediments.
- b. There exists the potential for receptors to have access to the surface water sediments.
- c. There is little or no potential for receptors to have access to the surface water sediments.

To evaluate the potential for impacts on ecological receptors, one of the following statements was selected to best characterize the site.

- a. Evidence exists that wildlife habitat or wetland areas exist in or proximal to surface water sediments adjacent to or downstream of the site.
- b. The potential exists that wildlife habitat or wetland areas may exist in or proximal to surface water sediments adjacent to or downstream of the site.
- c. There is little or no potential for wildlife habitat or wetlands areas to exist in or proximal to surface water sediments adjacent to or downstream of the site.

4.2.2 Migration Pathway Factor

The Migration Pathway Factor (MPF) evaluates the likelihood of migration of contaminants off site in any of the environmental media. The MPF for each medium sampled at the individual sites was determined by selecting the most appropriate statement:

- a. Physical evidence or analytical data exist that indicate actual off-site migration of contaminants.
- b. There is potential for contaminants to migrate to potential points of exposure, although no physical evidence or analytical data exist.
- c. There is low potential for contaminants to migrate to potential points of exposure either due to the chemical/physical characteristics of the contaminant(s) or by the presence of natural or engineering controls restricting migration.

4.3 SUMMARY OF SITE RANKING FOR NAS JRB WILLOW GROVE

A summary of relative risk ranking results for the applicable NAS JRB Willow Grove Sites is shown in Table 4-1. Complete relative risk ranking calculations are included in Appendix D.

TABLE 4-1
SITE RANKING SUMMARY
SITE MANAGEMENT PLAN
NAS JRB WILLOW GROVE

SITE	NAME	RELATIVE RANK
1	Privet Road Compound	High
2	Antenna Field landfill	Medium
3	Ninth Street Landfill	High
4	North End Landfill	Low
5	Fire training Area	High
6	Abandoned Rifle Range No. 1	Low
7	Abandoned Rifle Range No. 2	Low
8	Site 8 - Building 118 Abandoned Fuel Tank	Low
9	Steam Plant Building 6 Tank Overfill	Low
10	Navy Fuel Farm	Med
Suspected "Site"11	Aircraft Parking Apron	Low

4.4 SITE PRIORITIZATION

The ranking system described above was used to help prioritize sites for further investigation activities at NAS JRB Willow Grove. Other factors, including availability of funding or current funding allocations and proximity of sites to one another also affect site prioritization. The following list presents the order for site investigation and/or remediation activities:

- Site 1 (Decision Process/Removal Activities)
- Site 3 (Investigation)
- Site 2 (Decision Process/Removal Activities)
- Site 5 (Decision Process/Removal Activities)
- Site 10 (Remediation is complete. No further action unless major land use change occurs)
- Suspected "site" 11 Aircraft parking apron area (No further investigation)
- Sites 4, 6, 7, 8, and 9 are not applicable because they are No Further Action Sites

5.0 SITE MANAGEMENT PLAN SCHEDULES

Historical summaries for major investigative and project activities for each site are provided in Section 3.0. Projected schedules for the sites are presented in this section. These schedules are based on currently available information and are intended to be adjusted periodically during the decision making process or after new data become available. Appendix A presents master schedules showing all activities, report preparation, and review cycles planned for Sites 1, 2 and 5. No work is currently scheduled for Site 3.

5.1 SCHEDULING ASSUMPTIONS

5.1.1 Document Preparation and Review Assumptions

Durations for work plan and draft report preparation activities are based on available site information, site complexity, and the anticipated amount of new data to be generated by future field investigations.

The time required for document review varies based on the length and complexity of the document. For purposes of this SMP, documents have been categorized as either primary or secondary. Primary documents are the major deliverables associated with each phase of the remedial process as discussed in Section 2.0. Secondary documents fulfill portions of phased requirements and are assumed to be relatively straightforward in complexity and shorter in length than primary documents. Table 5-1 presents the primary documents for the various remedial process phases and their associated secondary documents. Table 5-2 presents the schedule for completion of review and response to comments for primary and secondary documents.

Time required to complete draft deliverables has been based on historical data for preparation and submittal of similar documents. Estimated schedules will be included in site-specific work plans. These schedules will be adjusted to account for impacts from new data or availability of funding.

TABLE 5-1
PRIMARY AND SECONDARY DOCUMENTS
NAS JRB WILLOW GROVE

Primary Documents	Secondary Documents
Site Screening Process (PA, SI) Work Plans	Health and Safety Plans
Site Screening Process Reports	Non-Time Critical Removal Action Plans
RI/FS and FFS Work Plans	Pilot/Treatability Study Work Plans
Remedial Investigation Reports	Pilot/Treatability Study Reports
FS and FFS Reports	N/A
Proposed Plans	Engineering Evaluation/Cost Analysis Reports
Final Remedial Designs	N/A
Remedial Action Work Plans <ul style="list-style-type: none"> • Remedial Action Sampling Plan • Remedial Action Construction Quality Assurance Plan • Remedial Action Environmental Monitoring Plan 	Preliminary Conceptual Design or Equivalent
Remedial Action Completion Reports	Prefinal Remedial Designs
Operation and Maintenance Plans	Periodic Review Assessment Reports
Site Management Plan	Removal Action Memoranda
Community Relations Plan	N/A
Long-Term Remedial Action Monitoring Plan	N/A

PA = Preliminary Assessment
SI = Site Inspection
RI/FS = Remedial Investigation/Feasibility Study
FFS = Focused Feasibility Study
N/A = Not Applicable

Table 5-2
DOCUMENT REVIEW AND REVISION SCHEDULE
NAS JRB WILLOW GROVE

Primary Document	Review Duration	Response Duration⁽³⁾
Preliminary Draft Document	60 Days ⁽¹⁾	60 Days
Draft Document	60 Days ⁽²⁾	60 Days
Draft Final Document	30 Days ^(1,2)	30 Days
Final Document	N/A	N/A

N/A = Not Applicable

⁽¹⁾ Navy Review

⁽²⁾ Agency (PADEP, EPA) Review

⁽³⁾ Incorporation of comments and submittal of revised report

Note: Review and response duration periods for secondary documents are expected to be 1/2 the timeframe of primary documents.

Estimated document preparation times for preliminary draft documents are presented in Table 5-3. These durations are the time required to complete various preliminary draft deliverables after completion of field activities.

5.1.2 Field Investigation and Sample Analysis/Validation Assumptions

The schedule for field investigations includes mobilization/demobilization of all equipment and personnel, including procurement and oversight of subcontractors where required, and conduct all field activities. The schedule also allows for proper handling and disposal of investigation-derived wastes (IDW). The duration of these events is dependent on the number and types of samples collected, role of subcontractors (e.g., drilling and monitoring well installation, surveying, etc.), and accessibility of the site to complete the field activities.

It has been assumed for scheduling purposes that samples will be analyzed and reported using standard 28-day laboratory turnaround time. Data validation activities are scheduled for completion within 21 days of receipt of laboratory data.

5.2 SITE MANAGEMENT PLAN ASSUMPTIONS

This section provides the document preparation durations for the NAS JRB Willow Grove sites. Schedules for RI/FS and RD/RA activities are compressed to the greatest extent possible by overlapping tasks and reducing redundancy in data collection efforts wherever possible. The degree of dependency between the various tasks and documents determines the extent of overlap. Key dependencies between tasks and related assumptions are:

- Remedial Investigation: Preparation of the preliminary draft RI report is assumed to start once all analytical data are received. Some RI tasks can begin before data are validated.
- Feasibility Study: Preparation of the preliminary draft FS is assumed to start approximately 2 months following the start of the RI report. A large portion of the FS is dependent on the nature and extent of contamination, which are addressed in the RI.

TABLE 5-3
DOCUMENT PREPARATION DURATIONS
NAS JRB WILLOW GROVE

Document	Duration (Months) ⁽¹⁾
Site Inspection Report	2
Remedial Investigation Report	4
Feasibility Study	4
Proposed Plan	2
Record of Decision	2
Draft Remedial Design/Work Plan	5
Prefinal Remedial Design/Work Plan	2
Final Design/Work Plan	2
Engineering Evaluation/Cost Analysis	2
Removal Action Memorandum	1
30% Removal Action Design	1
90% Removal Action Design	2
Final Removal Action Design	1
Treatability Study Work Plan	2
Treatability Study Report	1

⁽¹⁾ Durations represent estimated time required to complete preliminary draft documents after completion of field activities.

- **Proposed Plan:** Preparation of the preliminary draft Proposed Plan is assumed to start following receipt of EPA and state comments on the draft FS. Selection of the proposed remedial action(s) is dependent on regulatory approval of the recommended alternative(s) presented in the FS.
- **Record of Decision:** Preparation of the draft ROD is assumed to start after completion of the public comment period on the Proposed Plan. Community acceptance of the Proposed Plan must be considered in the selection of the interim or final remedial action(s).
- **Remedial Design:** The remedial alternative(s) must be selected prior to initiation of the remedial design; therefore, RD activities will commence following finalization of the ROD.

6.0 REFERENCES

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APPENDIX A
MASTER SCHEDULES FOR ACTIVE REMEDIAL RESPONSE ACTIVITIES

CTO 003 SCHEDULE

Task	CTO Plan Begin	Act. Begin	CTO Plan End	Act. End	% Comp.	2004				2005			
						Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4
Notice to Proceed	3/29/04	NA	3/29/04	NA	0%								
SITE 1	3/29/04	3/29/04	4/28/05	NA	37%								
Site 1 Addendum to Remedial Investigation	3/29/04	3/29/04	7/23/04	NA	50%								
Prepare Site 1 Draft Addendum to RI	3/29/04	3/29/04	5/13/04	7/15/04	100%								
Submit Site 1 Draft Addendum to RI	5/13/04	7/15/04	5/13/04	7/15/04	100%								
Regulatory Review	5/14/04	7/16/04	6/18/04	NA	25%								
Prepare Site 1 Final Addendum to RI	6/21/04	NA	7/23/04	NA	0%								
Submit Site 1 Final Addendum to RI	7/23/04	NA	7/23/04	NA	0%								
Site 1 Soil PRAP	4/19/04	4/19/04	10/7/04	10/20/04	100%								
Prepare Site 1 Soil Internal Draft PRAP	4/19/04	4/19/04	5/7/04	5/18/04	100%								
Submit Site 1 Soil Internal Draft PRAP	5/7/04	5/18/04	5/7/04	5/18/04	100%								
Navy Review	5/10/04	5/19/04	5/28/04	6/8/04	100%								
Prepare Site 1 Soil Draft PRAP	5/31/04	6/9/04	6/30/04	6/17/04	100%								
Submit Site 1 Soil Draft PRAP	7/9/04	6/17/04	7/9/04	6/17/04	100%								
Regulatory Review	7/9/04	6/18/04	8/20/04	9/17/04	100%								
Prepare Site 1 Soil Final PRAP	9/10/04	9/17/04	9/17/04	9/21/04	100%								
Submit Site 1 Soil Final PRAP	9/17/04	9/21/04	9/17/04	9/21/04	100%								
Public Meeting Notice	9/17/04	9/29/04	9/17/04	9/29/04	100%								
Public Meeting	10/6/04	10/6/04	10/6/04	10/6/04	100%								
Stenographer's Report	10/20/04	10/20/04	10/20/04	10/20/04	100%								
Site 1 Soil NFA ROD	10/21/04	NA	2/22/04	NA	0%								
Prepare Site 1 Soil Internal Draft NFA ROD	10/21/04	NA	11/9/04	NA	0%								
Submit Site 1 Soil Internal Draft NFA ROD	11/9/04	NA	11/9/04	NA	0%								
Navy Review	11/10/04	NA	12/2/04	NA	0%								
Prepare Site 1 Soil Draft NFA ROD	12/3/04	NA	12/21/04	NA	0%								
Submit Site 1 Soil Draft NFA ROD	12/21/04	NA	12/21/04	NA	0%								
Regulatory Review	12/22/04	NA	2/1/05	NA	0%								
Prepare Site 1 Soil Final NFA ROD	2/2/05	NA	2/22/05	NA	0%								
Submit Site 1 Soil Final NFA ROD	2/22/05	NA	2/22/05	NA	0%								
Site 1 GW PRAP	9/13/04	NA	2/10/05	NA	0%								
Prepare Site 1 GW Internal Draft PRAP	9/13/04	NA	9/30/04	NA	0%								
Submit Site 1 GW Internal Draft PRAP	9/30/04	NA	9/30/04	NA	0%								
Navy Review	9/30/04	NA	10/28/04	NA	0%								
Prepare Site 1 GW Draft PRAP	10/28/04	NA	11/11/04	NA	0%								
Submit Site 1 GW Draft PRAP	11/11/04	NA	11/11/04	NA	0%								
Regulatory Review	11/11/04	NA	12/23/04	NA	0%								
Prepare Site 1 GW Final PRAP	12/23/04	NA	1/11/05	NA	0%								

12/08/04



Critical Path Item - Anticipated Progress
 Critical Path Item - Actual Progress
 Noncritical Path Item - Anticipated Item
 Noncritical Path Item - Actual Progress
 CTO Schedule

CTO Schedule Milestone
 Anticipated Milestone
 Actual Milestone
 Summary
 External Milestone

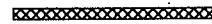
CTO 003 SCHEDULE

Task	CTO Plan Begin	Act. Begin	CTO Plan End	Act. End	% Comp.	2004				2005			
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Submit Site 1 GW Final PRAP	1/11/05	NA	1/11/05	NA	0%								
Public Meeting Notice	1/11/05	NA	1/11/05	NA	0%								
Public Meeting	1/27/05	NA	1/27/05	NA	0%								
Stenographer's Report	2/10/05	NA	2/10/05	NA	0%								
Site 1 GW NFA ROD	2/10/05	NA	6/15/05	NA	0%								
Prepare Site 1 GW Internal Draft NFA ROD	2/10/05	NA	3/2/05	NA	0%								
Submit Site 1 GW Internal Draft NFA ROD	3/2/05	NA	3/2/05	NA	0%								
Navy Review	3/2/05	NA	3/23/05	NA	0%								
Prepare Site 1 GW Draft NFA ROD	3/23/05	NA	4/13/05	NA	0%								
Submit Site 1 GW Draft NFA ROD	4/13/05	NA	4/13/05	NA	0%								
Regulatory Review	4/13/05	NA	5/25/05	NA	0%								
Prepare Site 1 GW Final NFA ROD	5/25/05	NA	6/15/05	NA	0%								
Submit Site 1 GW Final NFA ROD	6/15/05	NA	6/15/05	NA	0%								
SITE 2	3/29/04	3/29/04	5/25/05	NA	40%								
Site 2 RI	3/29/04	3/29/04	9/15/04	NA	83%								
Prepare Site 2 Revised Draft RI Report	3/29/04	3/29/04	7/14/04	10/6/04	100%								
Submit Site 2 Revised Draft RI Report	7/14/04	10/6/04	7/14/04	10/6/04	100%								
Regulatory Review	7/15/04	NA	8/25/04	NA	0%								
Prepare Site 2 Final RI Report	8/26/04	NA	9/15/04	NA	0%								
Submit Site 2 Final RI Report	9/15/04	NA	9/15/04	NA	0%								
Site 2 Soil and GW PRAP	9/16/04	NA	2/16/05	NA	0%								
Prepare Site 2 Soil and GW Internal Draft PRAP	9/16/04	NA	10/6/04	NA	0%								
Submit Site 2 Soil and GW Internal Draft PRAP	10/6/04	NA	10/6/04	NA	0%								
Navy Review	10/7/04	NA	10/27/04	NA	0%								
Prepare Site 2 Soil and GW Draft PRAP	10/28/04	NA	11/17/04	NA	0%								
Submit Site 2 Soil and GW Draft PRAP	11/17/04	NA	11/17/04	NA	0%								
Regulatory Review	11/18/04	NA	12/29/04	NA	0%								
Prepare Site 2 Soil and GW Final PRAP	12/30/04	NA	1/19/05	NA	0%								
Submit Site 2 Soil and GW Final PRAP	1/19/05	NA	1/19/05	NA	0%								
Public Meeting Notice	1/19/05	NA	1/19/05	NA	0%								
Public Meeting	2/2/05	NA	2/2/05	NA	0%								
Stenographer's Report	2/16/05	NA	2/16/05	NA	0%								
Site 2 Soil and GW NFA ROD	1/20/05	NA	5/25/05	NA	0%								
Prepare Site 2 Soil and GW Internal Draft NFA ROD	1/20/05	NA	2/9/05	NA	0%								
Submit Site 2 Soil and GW Internal Draft NFA ROD	2/9/05	NA	2/9/05	NA	0%								
Navy Review	2/10/05	NA	3/2/05	NA	0%								
Prepare Site 2 Soil and GW Draft NFA ROD	3/3/05	NA	3/23/05	NA	0%								

12/08/04



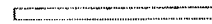
Critical Path Item - Anticipated Progress



Critical Path Item - Actual Progress



Noncritical Path Item - Anticipated Item



Noncritical Path Item - Actual Progress



CTO Schedule



CTO Schedule Milestone



Anticipated Milestone



Actual Milestone



Summary



External Milestone



CTO 003 SCHEDULE

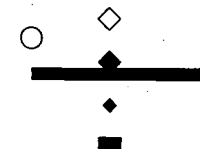
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Submit Site 2 Soil and GW Draft NFA ROD	3/23/05	NA	3/23/05	NA	0%								
Regulatory Review	3/24/05	NA	5/4/05	NA	0%								
Prepare Site 2 Soil and GW Final NFA ROD	5/5/05	NA	5/25/05	NA	0%								
Submit Site 2 Soil and GW Final NFA ROD	5/25/05	NA	5/25/05	NA	0%								
SITE 5	3/29/04	4/1/04	8/16/05	NA	20%								
Site 5 Soil Work Plan	3/29/04	4/1/04	5/14/04	6/2/04	100%								
Site 5 Soil Addendum to Remedial Investigation	9/27/04	8/4/04	12/15/04	NA	46%								
Prepare Internal Site 5 Soil Draft Addendum to RI	NA	8/4/04	NA	10/21/04	100%								
Submit Internal Site 5 Soil Draft Addendum to RI	NA	10/21/04	NA	10/21/04	100%								
Prepare Site 5 Soil Draft Addendum to RI	9/27/04	NA	10/13/04	NA	0%								
Submit Site 5 Soil Draft Addendum to RI	10/13/04	NA	10/13/04	NA	0%								
Regulatory Review	10/13/04	NA	11/24/04	NA	0%								
Prepare Site 5 Soil Final Addendum to RI	11/24/04	NA	12/15/04	NA	0%								
Submit Site 5 Soil Final Addendum to RI	12/15/04	NA	12/15/04	NA	0%								
Site 5 Soil PRAP	12/16/04	NA	6/8/05	NA	0%								
Prepare Site 5 Soil Internal Draft PRAP	12/16/04	NA	1/5/05	NA	0%								
Submit Site 5 Soil Internal Draft PRAP	1/5/05	NA	1/5/05	NA	0%								
Navy Review	1/5/05	NA	1/26/05	NA	0%								
Prepare Site 5 Soil Draft PRAP	1/26/05	NA	2/16/05	NA	0%								
Submit Site 5 Soil Draft PRAP	2/16/05	NA	2/16/05	NA	0%								
Regulatory Review	2/16/05	NA	3/30/05	NA	0%								
Prepare Site 5 Soil PRAP Response to Comments	3/30/05	NA	4/19/05	NA	0%								
Submit Site 5 Soil PRAP Response to Comments	4/19/05	NA	4/19/05	NA	0%								
Prepare Site 5 Soil Final PRAP	4/19/05	NA	5/11/05	NA	0%								
Submit Site 5 Soil Final PRAP	5/11/05	NA	5/11/05	NA	0%								
Public Meeting Notice	5/11/05	NA	5/11/05	NA	0%								
Public Meeting	5/25/05	NA	5/25/05	NA	0%								
Stenographer's Report	6/8/05	NA	6/8/05	NA	0%								
Site 5 Soil ROD	5/12/05	NA	9/14/05	NA	0%								
Prepare Site 5 Soil Internal Draft ROD	5/12/05	NA	6/1/05	NA	0%								
Submit Site 5 Soil Internal Draft ROD	6/1/05	NA	6/1/05	NA	0%								
Navy Review	6/1/05	NA	6/22/05	NA	0%								
Prepare Site 5 Soil Draft ROD	6/22/05	NA	7/13/05	NA	0%								
Submit Site 5 Soil Draft ROD	7/13/05	NA	7/13/05	NA	0%								
Regulatory Review	7/13/05	NA	8/24/05	NA	0%								
Prepare Site 5 Soil Final ROD	8/24/05	NA	9/14/05	NA	0%								
Submit Site 5 Soil Final ROD	9/14/05	NA	9/14/05	NA	0%								

12/08/04



Critical Path Item - Anticipated Progress
 Critical Path Item - Actual Progress
 Noncritical Path Item - Anticipated Item
 Noncritical Path Item - Actual Progress
 CTO Schedule

CTO Schedule Milestone
 Anticipated Milestone
 Actual Milestone
 Summary
 External Milestone



CTO 003 SCHEDULE

Task	CTO Plan Begin	Act. Begin	CTO Plan End	Act. End	% Comp.	2004				2005			
						Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4
Site 5 GW Feasibility Study	5/20/04	8/4/04	9/22/04	NA	28%								
Prepare Site 5 GW Draft FS Report	5/20/04	8/4/04	7/5/04	9/21/04	100%								
Submit Site 5 GW Draft FS Report	7/5/04	9/21/04	7/5/04	9/21/04	100%								
Regulatory Review	7/6/04	NA	8/17/04	NA	0%								
Receive Site 5 GW FS Regulatory Comments	8/17/04	NA	8/17/04	NA	0%								
Prepare Site 5 GW FS Response to Comments	8/17/04	NA	8/27/04	NA	0%								
Submit Site 5 GW FS Response to Comments	8/30/04	NA	8/30/04	NA	0%								
Prepare Site 5 GW Final FS Report	8/30/04	NA	9/22/04	NA	0%								
Submit Site 5 GW Final FS Report	9/22/04	NA	9/22/04	NA	0%								
Site 5 GW PRAP	8/27/04	NA	2/4/05	NA	0%								
Prepare Site 5 GW Internal Draft PRAP	8/27/04	NA	9/24/04	NA	0%								
Submit Site 5 GW Internal Draft PRAP	9/24/04	NA	9/24/04	NA	0%								
Navy Review	9/24/04	NA	10/14/04	NA	0%								
Prepare Site 5 GW Draft PRAP	10/14/04	NA	11/5/04	NA	0%								
Submit Site 5 GW Draft PRAP	11/5/04	NA	11/5/04	NA	0%								
Regulatory Review	11/5/04	NA	12/16/04	NA	0%								
Prepare Site 5 GW Final PRAP	12/16/04	NA	1/7/05	NA	0%								
Submit Site 5 GW Final PRAP	1/7/05	NA	1/7/05	NA	0%								
Public Meeting Notice	1/7/05	NA	1/7/05	NA	0%								
Public Meeting	1/21/05	NA	1/21/05	NA	0%								
Stenographer's Report	2/4/05	NA	2/4/05	NA	0%								
Site 5 GW ROD	12/16/04	NA	4/27/05	NA	0%								
Prepare Site 5 GW Internal Draft ROD	12/16/04	NA	1/12/05	NA	0%								
Submit Site 5 GW Internal Draft ROD	1/12/05	NA	1/12/05	NA	0%								
Navy Review	1/12/05	NA	2/1/05	NA	0%								
Prepare Site 5 GW Draft ROD	2/1/05	NA	2/23/05	NA	0%								
Submit Site 5 GW Draft ROD	2/23/05	NA	2/23/05	NA	0%								
Regulatory Review	2/23/05	NA	4/6/05	NA	0%								
Prepare Site 5 GW Final ROD	4/6/05	NA	4/27/05	NA	0%								
Submit Site 5 GW Final ROD	4/27/05	NA	4/27/05	NA	0%								
Site Management Plan (SMP)	6/1/04	9/14/04	9/30/04	NA	37%								
Prepare Internal Draft SMP	6/1/04	9/14/04	7/30/04	10/18/04	100%								
Submit Internal Draft SMP	7/30/04	10/18/04	7/30/04	10/18/04	100%								
Navy Review	8/2/04	10/18/04	8/20/04	10/28/04	100%								
Prepare Draft SMP	8/20/04	10/29/04	8/30/04	NA	2%								
Submit Draft SMP	8/30/04	NA	8/30/04	NA	0%								
Regulatory Review	9/2/04	NA	9/10/04	NA	0%								

12/08/04



Critical Path Item - Anticipated Progress
 Critical Path Item - Actual Progress
 Noncritical Path Item - Anticipated Item
 Noncritical Path Item - Actual Progress
 CTO Schedule



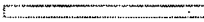




CTO Schedule Milestone
 Anticipated Milestone
 Actual Milestone
 Summary
 External Milestone

CTO 003 SCHEDULE

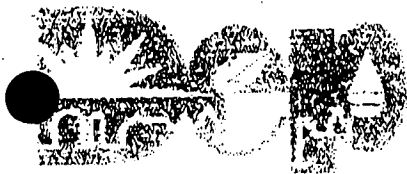
Task	CTO Plan Begin	Act. Begin	CTO Plan End	Act. End	% Comp.	2004				2005			
						Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4
Prepare Final SMP	9/13/04	NA	9/30/04	NA	0%								
Submit Final SMP	9/30/04	NA	9/30/04	NA	0%								

12/08/04



- Critical Path Item - Anticipated Progress 
- Critical Path Item - Actual Progress 
- Noncritical Path Item - Anticipated Item 
- Noncritical Path Item - Actual Progress 
- CTO Schedule 
- CTO Schedule Milestone 
- Anticipated Milestone 
- Actual Milestone
- Summary
- External Milestone

APPENDIX B
PADEP RESPONSE to NAVY No FURTHER ACTION PROPOSAL
IR SITE 10 - NAVY FUEL FARM



2 East Main Street
Norristown, PA 19401
October 1, 2004

Southeast Regional Office

Phone: 484-250-5960

Fax: 484-250-5961

Mr. Edward Boyle
Remedial Project Manager
Naval Facilities Engineering Command
EFA Northeast
Code EV21/EJB
Mail Stop No. 82
10 Industrial Highway
Lester, PA 19113-2090

Re: ECP - Land Recycling Program
NO FURTHER ACTION for Soil and
Groundwater
IR Site 10 - Navy Fuel Farm NASJRB
EFACTS No. 594686
Easton Road
Horsham Township
Montgomery County

Dear Mr. Boyle:

The Pennsylvania Department of Environmental Protection (Department) has completed review of the following documents submitted to the Department on your behalf by EA Engineering, Science, and Technology:

- "Final Report, Request for No Further Action, Installation Restoration (IR) Site 10 Ground-Water, Naval Air Station Joint Reserve Base, Horsham Township, Pennsylvania," received by the Department on September 29, 2004;
- "Addendum Final IR Site 10 Soil Letter Report to Support No Further Investigation at this Time, NASJRB, Willow Grove, PA," received by the Department on September 27, 2004;
- "IR Site 10 Soil Letter Report to Support No Further Investigation at this Time - Final," received by the Department on December 22, 2003; and
- The regional files associated with the named above facility.

Mr. Edward Boyle

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October 1, 2004

The Department believes that the information presented in the named above documents have presented the sufficient data to support NO FURTHER ACTION at this time for groundwater and soil at IR Site 10 - Navy Fuel Farm NASJRB for the releases of the regulated substances:

- Jet fuel - associated with the partially buried 210,000-gallon Tank No. 115; and
- Waste oil - associated with 500-gallon leaking underground storage tank.

This decision is based on current and historical groundwater and soil data supporting the premise that any areas of possible impact above the relevant Act 2 soil standards remaining at IR Site 10 are limited and not representative of unacceptable exposure based on current and presumed future land uses. Collecting present-day soil attainment samples at all known areas of concern was not feasible in consideration of the current land use with limited access according to the Department of the Navy.

IR Site 10 is approximately 2 acres and includes several aboveground storage tanks (AST's), associated aboveground piping, paved parking lots, paved roads, industrial buildings, and grass areas over the concrete slabs and soil. Several buried utilities, including water, electric, sewer, telephone, and product piping exist on and adjacent to the Navy Fuel Farm grounds.

In 1986, a spill occurred when former Tank No. 115 was overfilled and fuel was released from the vent pipe into the ground. During the same year, a utility trench was excavated along the western boundary of the site where light non-aqueous phase liquid (LNAPL) was observed floating on the water within the trench. The area where LNAPL was discovered is immediately adjacent to a former dry well. The dry well accepted water that was periodically siphoned from the bottom of the fuel tanks.

In March 1989, jet fuel was detected emanating from two patches of dead grass on the west side of partially buried Tank No. 115. The tank was subsequently emptied.

In 1991, two 210,000-gallon jet fuel tanks (Nos. 115 and 116), along with the underground 500-gallon waste oil and diesel fuel storage tanks, were removed. In addition, 6,500 cubic yards of possibly contaminated soil were removed and properly disposed during the tanks removal as part of the initial remediation. Subsequent to the completion of the removal activities, a new AST system set in a concrete berm was installed to the east of the former tank field location.

In 1998, a vacuum-enhanced LNAPL recovery system was installed to include recovery from three existing monitoring wells (NFFW-2R, NFFW-14, and NFFW-16) and had been taken offline in 2001.

From December 2001 to July 2000, LNAPL was not detected during monitoring events. In August 2002, the oil/water interface probe indicated the presence of LNAPL in RW-2R and RW-16. During 2003 and 2004 sampling events, LNAPL had not been detected within the existing monitoring network.

Mr. Edward Boyle

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October 1, 2004

The groundwater samplings had been conducted before the recovery system installation in 1993, 1997, and after completion of vacuum enhancement remediation in May-June 2003 and February 2004. The samples were analyzed for volatile organic compounds, semi-volatile organic compounds, target analyte list metals, and selected natural attenuation parameters (methane, ferrous iron, hydrogen sulfide, and sulfate). Analytical results of groundwater sampling demonstrated significant reduction in dissolved petroleum hydrocarbon concentration as a result of a natural attenuation in addition to the vacuum enhanced remediation system that was in operation.

A fate and transport analysis demonstrated that detected elevated concentration of benzene (10µg/l), bis(2-ethylhexyl)phthalate (190µg/l), and benzo(a)pyrene (0.27µg/l), during the last two monitoring events (2003 and 2004), will attenuate below used aquifer MSCs in non-residential setting before reaching the property boundary.

The Department recognizes that the elevated concentrations of iron, magnesium, and aluminum in groundwater do exceed the Secondary Maximum Contaminant Levels; however, these substances do not appear directly related to any past releases at Site 10. The laboratory analytical results indicated that concentration of lead exceeded MSC of 5.0µg/l in Monitoring Wells 10MW-2R (8.3µg/l) and 10MW-14 (5.4µg/l) during the 2003 monitoring event. During the 2004 monitoring event, lead was detected in 10MW-2R (5.1µg/l) and 10MW-7 (5.8µg/l); however, it had not been detected in the downgradient monitoring wells on the site during both monitoring events.

This letter does not document that all IR Site 10 soil is in compliance with the current calculated MSCs for all substances known or expected to have been released at Site 10 nor does this letter documents that all IR Site 10 soil occupying known or suspected areas of concern (AOC) is in compliance with the current MSCs.

The Department suggests it may be appropriate to seek a site closure under the technical requirements of Act 2 for known releases at IR Site 10 for soil and groundwater if base closure or significant changes in land use occur at the site in the future.

Thank you for your cooperation in working with the Department in the remediation of this site. Your efforts are helping to return land to productive use and prevent the needless loss of greenspace across the Commonwealth.

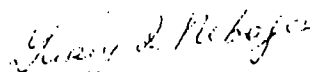
October 1, 2004

Mr. Edward Boyle


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If you have any questions or need further information regarding this matter, please contact the Environmental Cleanup Program.

Sincerely,



Yuriy I. Neboga
Project Officer
Environmental Cleanup



James R. Burke, P.G.
Licensed Professional Geologist
Environmental Cleanup

cc: Mr. Dale - Naval Facility Engineering Command
Mr. Edmond - NASJRB
Ms. Sheedy - Engineering, Science, and Technology
Ms. Flipse
Ms. Warren
Regional File
30 (AR04ECP)274-10

APPENDIX C
RELATIVE RISK SITE EVALUATION PRIMER

Department of Defense



Office of the Deputy Under Secretary of Defense
(Environmental Security)

Relative Risk Site Evaluation Primer

A Resource for Remedial Project Managers and
Other Interested Parties



Implementing the Relative Risk Concept in
Management Guidance for the Execution of the
Defense Environmental Restoration Program (DERP)

ENCLOSURE (1)

Summer 1996 (Revised Edition)



ACQUISITION AND
TECHNOLOGY

THE UNDER SECRETARY OF DEFENSE
3010 DEFENSE PENTAGON
WASHINGTON, D.C. 20301-3010



JUL 09 1996

MEMORANDUM FOR ASSISTANT SECRETARY OF THE ARMY
(INSTALLATIONS, LOGISTICS, AND THE ENVIRONMENT)
ASSISTANT SECRETARY OF THE NAVY
(INSTALLATIONS AND ENVIRONMENT)
ASSISTANT SECRETARY OF THE AIR FORCE
(MANPOWER, RESERVE AFFAIRS, INSTALLATIONS
AND ENVIRONMENT)
DIRECTOR, DEFENSE LOGISTICS AGENCY (D)

SUBJECT: Revised Relative Risk Site Evaluation Primer

I am pleased to provide you with a camera ready copy of the revised Relative Risk Site Evaluation Primer for printing and distribution. This revised edition of the Primer replaces the Relative Risk Site Evaluation Primer (Interim Edition, Summer 1994) and will be the basis for future relative risk site evaluations starting with the Fall 1996 data call that supports the FY 1996 Annual Report to Congress. Also, attached is a table that summarizes changes that have been made in the Primer.

The revised Primer contains enhanced technical guidelines for performing relative risk site evaluations which have been added in response to Department initiatives, as well as questions and comments received from Component field elements, regulatory agencies, and public stakeholders. The Interservice Relative Risk Work Group, supported by your staff, has produced a product that is comprehensive and filled with valuable information about implementation and use of relative risk site evaluation in the restoration program.

Relative risk site evaluations have become an integral part of the Department's risk management strategy. The site evaluations are a tool to help sequence work and to provide a basis for establishing goals and performance measures, as well as to assess progress and whether established goals reflect fiscal reality.

Attachment
As Stated

Paul Kaminski
Paul G. Kaminski



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1 Introduction

This revised edition of the Primer provides information on the relative risk site evaluation framework being used by the Department of Defense (DoD), in concert with stakeholders, to help sequence environmental restoration work at sites at active military installations, Base Realignment and Closure (BRAC) installations, and formerly used defense properties. It describes the structure and logic underpinning the framework and provides detailed instructions for conducting relative risk site evaluations in the field. It also describes how removal and remedial actions should be factored into relative risk site evaluations.

This document is a product of the Interservice Relative Risk Working Group—comprised of representatives from the Army, Navy, Air Force, and Defense Logistics Agency—that was formed in May 1994 to develop concepts and implementation procedures for the relative risk site evaluation framework.

This revised edition of the Primer replaces the *Relative Risk Site Evaluation Primer (Interim Edition, Summer 1994)* issued in September 1994, in its entirety. It contains enhanced technical guidelines for performing relative risk site evaluations which have been added in response to DoD initiatives as well as questions and comments received from DoD field elements, regulatory agencies, and stakeholders during the first twenty months of relative risk implementation.

The audience within DoD includes remedial project managers and other environmental personnel responsible for planning, executing, and evaluating environmental restoration activities at DoD installations and formerly

used defense sites (FUDS). The audience outside DoD includes federal and state regulatory agencies, local governments, and public stakeholders living or working in the vicinity of DoD installations and FUDS.

1.1 Definition of Relative Risk Site Evaluation

The relative risk site evaluation framework is a methodology used by all DoD Components to evaluate the relative risk posed by a site in relation to other sites. It is a tool used across all of DoD to group sites into high, medium, and low categories based on an evaluation of site information using three factors: the contaminant hazard factor (CHF), the migration pathway factor (MPF), and the receptor factor (RF). Factors are based on a quantitative evaluation of Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) hazardous substances, pollutants, or contaminants and a qualitative evaluation of pathways and human and ecological receptors in the four media most likely to result in significant exposure—groundwater, surface water, sediment, and surface soils. A representation of this evaluation concept is presented in Figure 1. Figure 1 also depicts possible opportunities for stakeholder input into the technical evaluation.

The relative risk site evaluation framework is a qualitative and easy to understand methodology for evaluating the relative risks posed by sites and should not be equated with more formal risk assessments conducted to assess baseline risks posed by sites. It is a tool to assist in sequencing environmental restoration work (i.e., known requirements such as remedial investigation or cleanup actions) to be done by a DoD Component. It is

designed to handle the broad range of sites that exist at DoD installations and the broad range of data available. Like any risk evaluation tool and perhaps more so than a comprehensive risk assessment, the relative risk site evaluation framework makes use of assumptions and approximations. Users should bear these limitations in mind when applying the framework. Relative risk is not the sole factor in determining the sequence of environmental restoration work, but it is an important consideration in the priority setting process. It should be factored into all priority setting decisions, and should be discussed with regulators and public stakeholders in the environmental restoration process, such as those mentioned above. The grouping of sites into high, medium, or low relative risk categories is not a substitute for either a baseline risk assessment or health assessment; it is not a means of placing sites into a Response Complete/No Further Action category; and it is not a tool for justifying a particular type of action (e.g., the selection of a remedy).

The relative risk site evaluation framework is used by all DoD Components to assess site relative risks at installations and formerly used defense properties. Use of the framework and resulting relative risk information allows DoD and DoD Components to communicate and help establish priorities for environmental restoration work.

The actual funding priority for a site is identified after relative risk information is combined with other important risk management considerations (e.g., the statutory and regulatory status of a particular installation or site, public stakeholder concerns, program execution considerations, and economic factors). A list of common risk management considerations can be found in Appendix E, page 39. These additional risk

management considerations can result in a decision to fund work at a site that is not classified as a high relative risk. DoD Components have each developed guidelines for combining relative risk and risk management considerations as part of their planning, programming, and budgeting process. The planning, programming, and budgeting process within DoD is outlined in Appendix E, page 16.

The relative risk site evaluation framework does not address the question of whether work is necessary at a site; it only provides information for use in helping to determine the general sequence in which sites will be addressed. At the DoD headquarters level, it also provides a framework for planning, programming, and budgeting requirements, a topic discussed further in Section 1.6.

Use of the relative risk site evaluation framework is restricted to environmental restoration sites and does not extend to unexploded ordnance (UXO) removal, building demolition/debris removal (BD/DR), potentially responsible party (PRP) activities, or compliance activities.

1.2 Rationale for Relative Risk Site Evaluation

In a 1994 report, entitled *Environmental Cleanup: Too Many High-Priority Sites Impede DoD's Program*, the General Accounting Office (GAO, 3 May 1994) concluded that the method used at that time by regulators and the DoD to determine which sites to work on first resulted in (1) too many similar priorities where too little got done, or (2) instances where DoD's worst sites were not getting priority attention. The report further stated that the approach in 1994, which was based solely on regulation-driven requirements, led to significant cost growth that strained limited resources and forced difficult choices.

Relative risk site evaluations are not required (NR) for sites classified as response complete (RC). Sites classified as RC are those where a DoD Component deems that no further action (NFA) is required with the possible exception of LTM. A RC determination requires that one of the following apply: (1) there is no evidence that contaminants were released at the site, (2) no contaminants were detected at the site other than at background concentrations, (3) contaminants attributable to the site are below action levels used for risk screening, (4) the results of a baseline risk assessment demonstrate that cumulative risks posed by the site are below established thresholds, or (5) removal and/or remedial action operations (RAOs) at a site have been implemented, completed, and are the final action for the site. Only LTM remains.

Relative risk site evaluations should be based on the information currently available on contaminants, migration pathways, and receptors. Sites lacking sufficient information for the conduct of a relative risk site evaluation should be given a "Not Evaluated" designation and should then be programmed for additional study, a removal action if warranted, or other appropriate response action, including deferral, before they are evaluated.

Sites comprised solely of abandoned ordnance are not subject to the relative risk site evaluation described in this Primer. Such sites should be evaluated using a separate risk procedure, which is discussed in the management guidance cited above (Office of the Under Secretary of Defense [Environmental Security], 1994).

1.5 Implementation of the Relative Risk Site Evaluation Framework

DoD's goal is to conduct relative risk site evaluations at the field level with the

involvement of the regulators and public stakeholders (see Figure 1). The technical evaluation of sites using the evaluation framework can serve as a basis for discussion and negotiation with regulators and public stakeholders. In particular, regulators and public stakeholders can help identify receptors, and can make judgments about the extent of contaminant migration in various environmental media at a site. Where they exist, Restoration Advisory Boards (RABs) are an excellent forum for obtaining public stakeholder input on these aspects of site relative risk. Other opportunities for public stakeholder involvement may also be appropriate. Regulators and public stakeholders should always be given the opportunity to participate in the development and review of relative risk site evaluation data before the data is used in planning and programming.

As lessons are learned during this implementation phase, DoD will continue to make appropriate adjustments and improvements to the framework through the established interservice working group, as has been done in this revised Primer.

1.6 Management Uses of Relative Risk Information

DoD and DoD Components are using the relative risk site evaluation framework as a tool to help sequence work at sites and as a headquarters program management tool. As a program management tool, the framework is being used by DoD and DoD Components to periodically identify the distribution of sites in each of three relative risk categories—high, medium, and low. A series of discrete relative risk site evaluations provides headquarters program managers with a macro-level view of changes in relative risk distributions within DoD over time.

2 Description of Relative Risk Site Evaluation Framework

This section provides information on the structure and logic underpinning the relative risk site evaluation framework and provides definitions of each relative risk factor by environmental medium.

The relative risk site evaluation framework is based on information fundamental to risk assessment: sources, pathways, and receptors. These elements are building blocks of a conceptual site model, a tool used in field investigation and risk assessment to organize site information.

Relative risks to human health for cancer and toxicity, as well as to ecological systems, are addressed in the relative risk site evaluation framework.

The framework uses recent/representative site information to evaluate the following four media and their exposure endpoints:

- Groundwater (human endpoint)
- Surface water
 - Human endpoint
 - Ecological endpoint
- Sediments
 - Human endpoint
 - Ecological endpoint
- Surface soils, preferably from a depth of 0-6 inches (human endpoint)

Air is not considered by the relative risk site evaluation framework because the risk through this pathway from DoD sites without soil contamination generally is minimal, and the PRGs for contaminated soils consider inhalation of volatiles and contaminated particles (U.S. EPA, *Region IX Preliminary Remediation Goals, Second Half*, 1 September 1995). (The PRGs for water consider inhalation for water contaminated with volatiles.)

Each environmental medium is evaluated using three factors that relate to the three structural components of the conceptual site model used in risk assessment: CHF (relationship of contaminants to comparison values), MPF (likelihood/extent of contaminant migration), and RF (likelihood of receptor exposure to contamination). Each of these three factors is given a rating (e.g., *Significant*, *Moderate*, or *Minimal* for CHF) based on recent/representative site information for a given medium. For each environmental medium, factor ratings are combined to determine the environmental medium-specific rating of *High*, *Medium*, or *Low*. The site is then placed in an overall category of *High*, *Medium*, or *Low*, based on the highest medium-specific rating. This site-specific process is illustrated schematically in Figure 2. Figure 3 expands on Figure 2 and illustrates the decision framework for the relative risk site evaluations.

As shown in Figure 3, only sites with reliable (i.e., most recent/representative) contaminant data will be evaluated using the framework. Do not perform evaluations on sites classified as RIP and RC, and do not perform evaluations at sites comprised solely of ordnance. If data are available for only one medium, a site can be evaluated for relative risk. If data are absent, sites should be designated "Not Evaluated." Action on these sites may be deferred, or the sites may be programmed for additional study before they are evaluated. In addition, a removal action or other response action may be appropriate.

Figures 4 through 6 provide definitions of each factor for groundwater, surface water and sediment, and surface soils, respectively. Factors and associated rating definitions should be used together with detailed

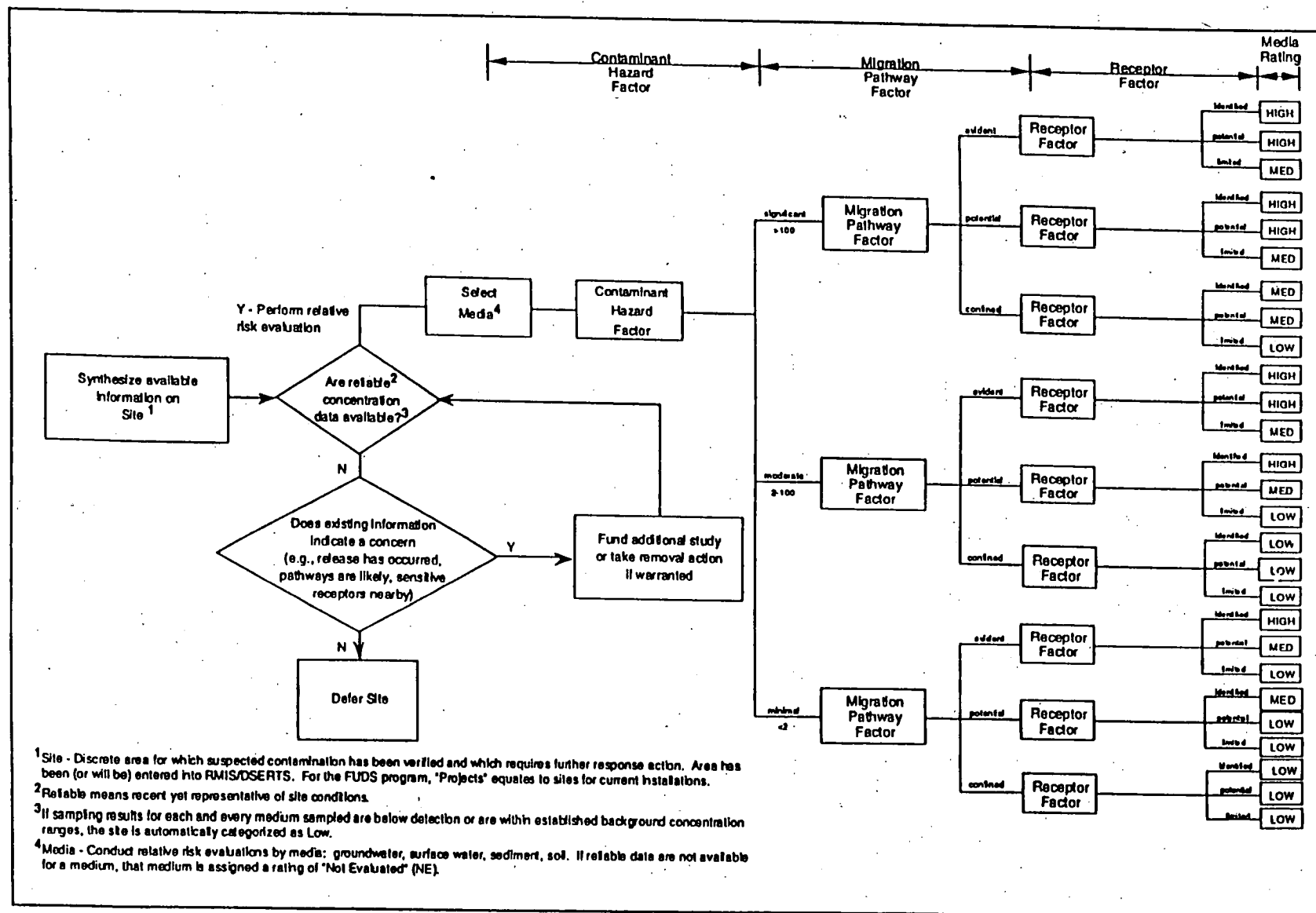


Figure 3. Relative Risk Site Evaluation Framework: Decision Flowchart

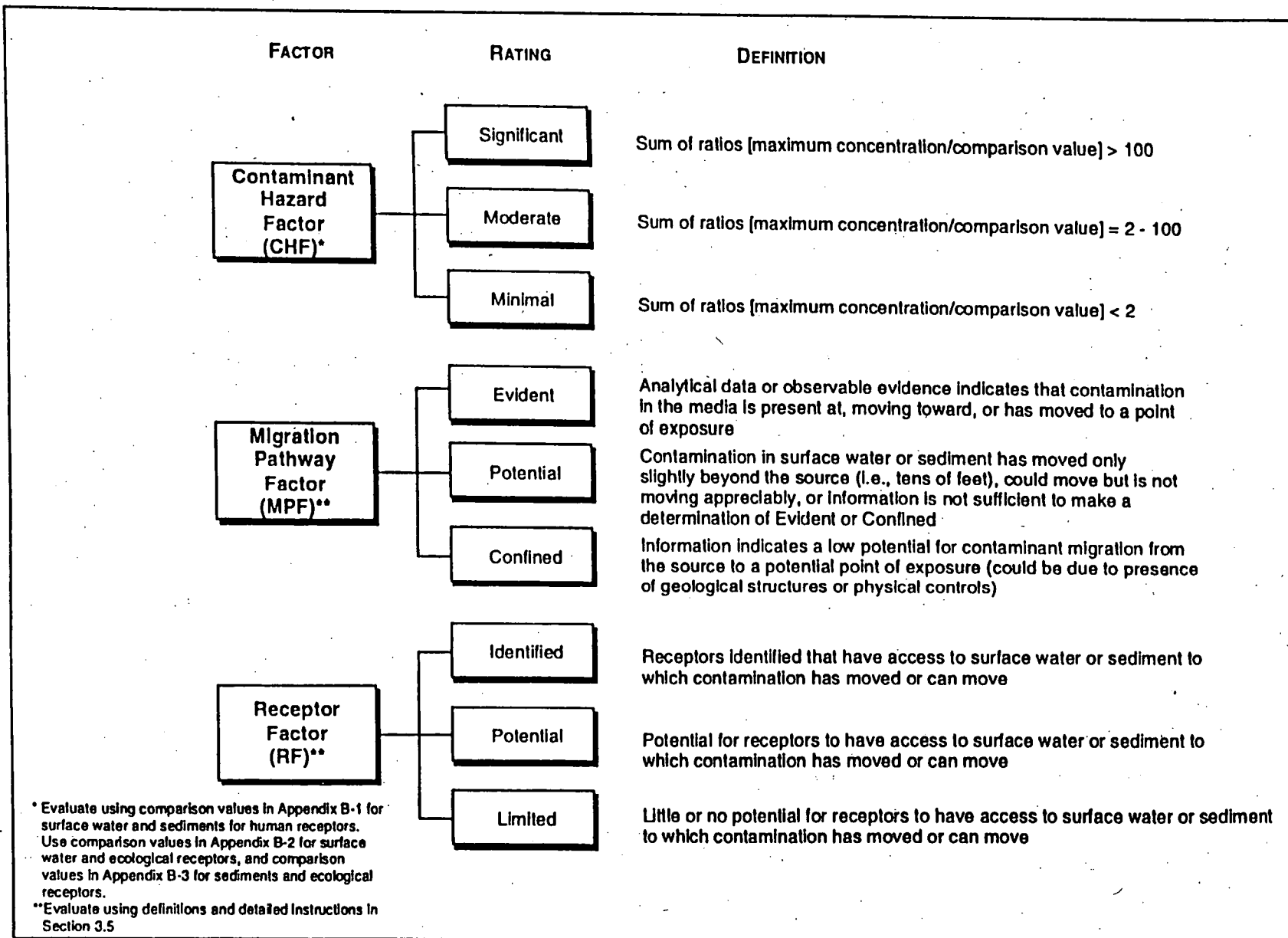


Figure 5. Relative Risk Site Evaluation Factor Information for Surface Water and Sediment

instructions in Section 3. Use of factor definitions and corresponding instructions in Section 3 ensures a common categorization method across DoD Components.

2.1 Contaminant Hazard Factor

The CHF is based on the ratio of the maximum concentration of a contaminant detected in an environmental medium to a risk-based comparison value for that contaminant in that medium. Detected contamination must be recent yet representative of site conditions. Comparison values are listed in Appendix B.

For carcinogens, the comparison value for human health is the concentration that presents a 1-in-10,000 risk of increased cancer incidence, which is the remedial action threshold for carcinogens defined in the Preamble to the National Oil and Hazardous Substance Pollution Contingency Plan (55 Federal Register 8716, March 8, 1990) and by Directive 9355.0-30 of the Office of Solid Waste and Emergency Response, U.S. EPA (22 April 1991). For non-carcinogens, the comparison value for human health is the concentration that provides an exposed individual with the daily reference dose (RfD), which is the estimated daily exposure level of a contaminant to a human population below which adverse non-cancer health effects are not anticipated.

For ecological endpoint evaluations, comparison values are based on ambient water quality criteria (for the surface water medium) or sediment screening values developed by either NOAA or the Ontario Ministry of Environment and Energy.

For a medium that contains more than one contaminant, the ratios from the individual contaminants are added. A CHF of *significant* (sum of ratios is greater than 100), *moderate* (from 2 to 100), or *minimal* (less than 2) is assigned on the basis of the

magnitude of the ratio or sum of ratios. The breakpoints were established by the interservice working group after reviewing the results of a considerable number of site distributions derived from a range of different breakpoints. Further discussion of these breakpoints is provided in Question 11 of the Question and Answer Factsheet, contained in Appendix E. The mechanics of the CHF calculations are described in detail in Section 3.3 of the Instructions.

2.2 Migration Pathway Factor

Information about migration pathways of contamination for a site is summarized as the MPF. MPFs of *evident*, *potential*, or *confined* are determined by matching available site information on pathways with the corresponding definitions about the likelihood of contaminant migration shown in Figures 4 through 6. Individuals or groups performing the relative risk site evaluations should determine the MPF on the basis of consideration of available site information, the definitions in Figures 4 through 6, the detailed instructions associated with medium-specific MPF evaluations in Section 3, and professional judgment.

2.3 Receptor Factor

Information about the present or future likelihood of receptors for each site is summarized as the RF. RFs of *identified*, *potential*, or *limited* are determined by matching available information on receptors at sites with the definitions in Figures 4 through 6. These statements, like those for the MPF, should be considered on the basis of available information, detailed instructions associated with medium-specific RF evaluations in Section 3, and professional judgment.

Human and ecological receptors (i.e., endpoints for exposure) to be considered are as follows:

Table 1. EPA Groundwater Classification Guidelines*

Class I Groundwater**	Special groundwater is (1) highly vulnerable to contamination because of the hydrological characteristics of the areas in which it occurs and (2) irreplaceable; no reasonable alternative source of drinking water is available to substantial populations.	<p>If water supply wells in Class I groundwater are threatened, the receptor factor is <i>Identified</i>.</p> <p>If water supply wells in Class I groundwater are not threatened the receptor factor is <i>Potential</i>.</p>
Class II Groundwater	Current and potential source of drinking water and water having other beneficial uses includes all other groundwater that is currently used (IIA) or is potentially available (IIB) for drinking water, agriculture, or other beneficial use.	<p>If water supply wells in Class IIA groundwater are threatened, the receptor factor is <i>Identified</i>.</p> <p>If water supply wells in Class IIA groundwater are not threatened, the receptor factor is <i>Potential</i>.</p> <p>If groundwater is Class IIB, the receptor factor is <i>Potential</i>.</p>
Class III Groundwater	<p>Groundwater that is not considered a potential source of drinking water and of limited beneficial use (Class IIIA and Class IIIB), is saline (i.e., it has a total dissolved solids level over 10,000 milligrams per liter [mg/l]), or is otherwise contaminated by naturally occurring constituents or human activity that is not associated with a particular waste disposal activity or another site beyond levels that allow remediation using methods reasonably employed in public water treatment systems. Class III also includes groundwater that is not available in sufficient quantity at any depth to meet the needs of an average household.</p> <p>Class IIIA includes groundwater that is interconnected to surface water or adjacent groundwater that potentially could be used for drinking water.</p> <p>Class IIIB includes groundwater that has no interconnection to surface water or adjacent aquifers.</p>	<p>If groundwater is Class III, the receptor factor is <i>Limited</i>.</p>

*Guidelines for Groundwater Classification Under the EPA Groundwater Protection Strategy, Office of Groundwater Protection, December 1986.

**Special groundwater is also ecologically vital; the aquifer provides the base flow for a particularly sensitive ecological system that, if polluted, would destroy a unique habitat (this characteristic is not applicable for relative risk site evaluation since ecological receptors are not evaluated for groundwater)

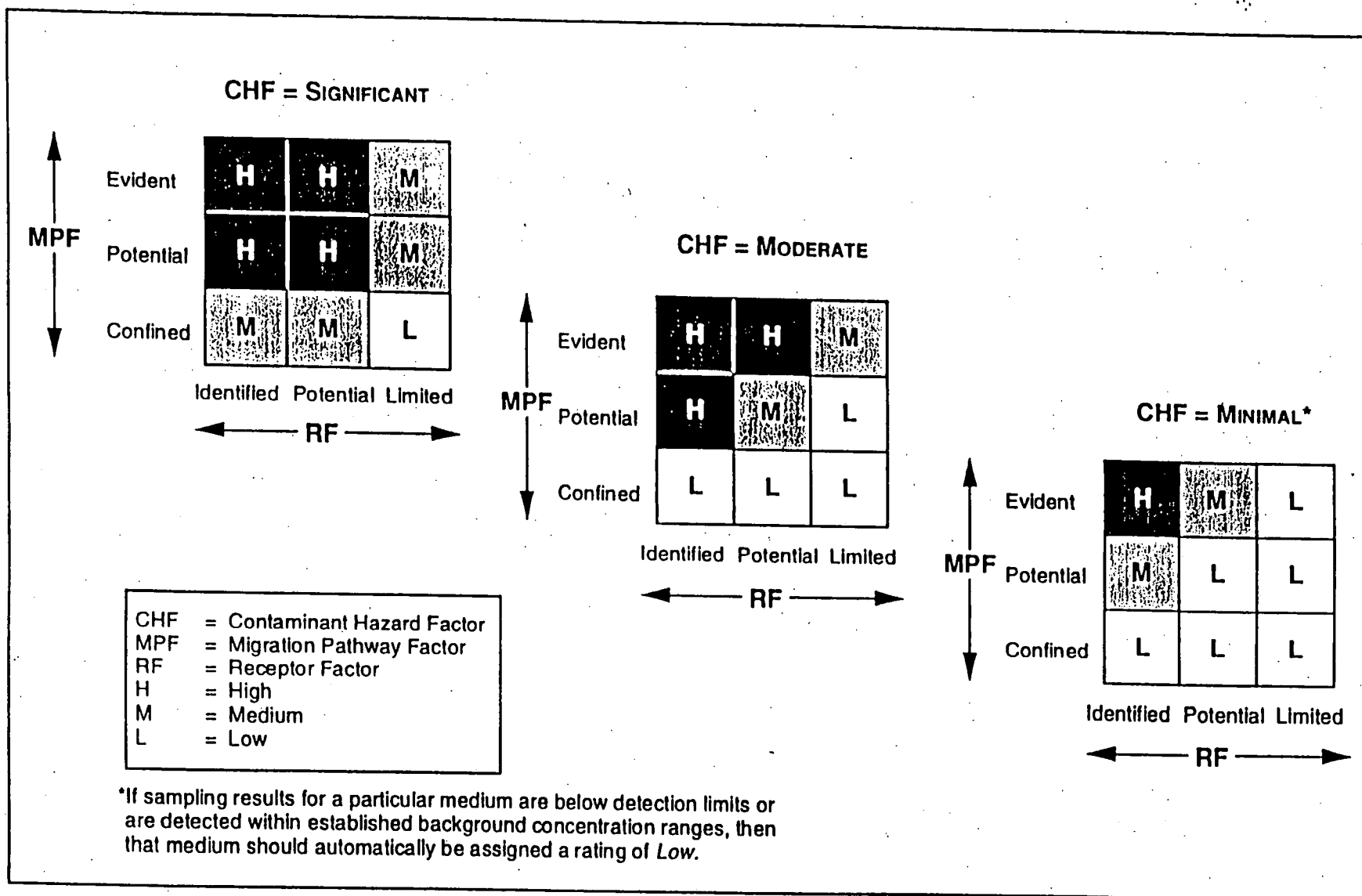


Figure 7. Relative Risk Site Evaluation Matrix

3 Instructions for Relative Risk Site Evaluations

This section provides a set of general and specific instructions for conducting relative risk site evaluations at installations and formerly used defense sites (FUDS). The general instructions in Section 3.1 apply throughout the evaluation. Instructions on performing medium-specific evaluations and completing specific parts of the Relative Risk Site Evaluation Worksheet follow in Sections 3.2 through 3.6. Because it forms the basis of so much of the evaluation, the CHF, as it applies to all media, is discussed in detail. Following that, instructions for evaluating each medium are given, with specific instructions for each of the factors in that medium.

3.1 General Instructions

Use the Relative Risk Site Evaluation Worksheet, in Appendix A (or its electronic equivalent), to record pertinent information on the site being evaluated. Page 1 of the Worksheet asks for information on the site. Pages 2 through 7 ask for information on each environmental medium (groundwater, surface water [human and ecological endpoints], sediment [human and ecological endpoints], and soil) and cover determinations of the CHF, MPF, and RF for each medium.

Proceed through the Worksheet using the specific instructions in this Primer. Evaluate all media with reliable analytical data at all sites; designate those sites without reliable analytical data as "Not Evaluated." See Figure 3 for an illustration of this decision logic.

Use the most recent yet representative sampling and analysis data from existing restoration documents or databases to complete the Worksheet; additional data gathering activities are not required.

Examples of such documents include completed site inspections, remedial investigations, feasibility studies, engineering evaluations/cost analysis studies, records of decision, decision documents, design documents, performance monitoring reports, and equivalent types of information.

When conducting relative risk site evaluations for sites contaminated solely with petroleum, oils, and lubricants (POL), do not use Total Petroleum Hydrocarbon data. Instead, use the concentrations for benzene, toluene, ethylbenzene, and xylene (BTEX) compounds in each medium, together with corresponding BTEX standards, to calculate the CHF. Support for using BTEX compounds in the evaluation of POL contamination can be found in *Use of Risk Based Standards for Cleanup of Petroleum Contaminated Soil* (Department of the Air Force, June 1994).

When conducting relative risk site evaluations for sites contaminated with POL *and* other contaminants, use the concentrations for BTEX compounds and the other contaminants present, together with their corresponding comparison values, to calculate the CHF.

Do not perform relative risk site evaluations at sites that are categorized as either "response complete" (RC) or "all remedies in place" (RIP). See Sections 1.4 and 4 for these definitions. Do not perform relative risk site evaluations on sites without reliable concentration data. These sites should be categorized as Not Evaluated (NE). Finally, do not perform relative risk site evaluations on PRP sites and sites comprised solely of ordnance.

<u>Contaminants</u>		<u>Calculation*****</u>	<u>Rating</u>
Carcinogen A:	$[A]_{\max}$	$\frac{[A]_{\max}}{\text{Std}^{**}} + \frac{[B]_{\max}}{\text{Std}^{**}} + \frac{[C]_{\max}}{\text{Std}^{***}} = X_1$	$>100 = \text{Significant CHF}$ $2-100 = \text{Moderate CHF}$ $<2 = \text{Minimal CHF}$
Carcinogen B:	$[B]_{\max}$		
Non-carcinogen C:	$[C]_{\max}$		
Ecological D:	$[D]_{\max}$	$\frac{[D]_{\max}}{\text{Std}^{****}} = X_2$	
<p> $[A]^*$ - Maximum concentration in medium Std^{**} - Comparison value based on 10^{-4} human cancer incidence Std^{***} - Comparison value based on reference dose for humans Std^{****} - Comparison value for ecological receptors where available </p> <p>*****Use comparison values in Appendix B-1, B-2, or B-3, as appropriate</p> <p>Note: Contaminants posing a threat to ecological receptors (i.e., ecological contaminants) must be evaluated separately from those posing a threat to human receptors</p>			

Figure 8. Mechanics of the Contaminant Hazard Factor Calculation

concentration ranges, then that medium should automatically be assigned a rating of *Low*. If sampling results for each and every medium sampled are below detection or are within established background concentration ranges, the site is automatically assigned a category of *Low* (see Figure 3).

For each contaminant listed on the Worksheet, record the most recent yet representative maximum detected concentration of that contaminant in that medium at that site on the Worksheet. Adjacent to this value record the appropriate comparison value for the contaminant from Appendix B-1, B-2, or B-3. (See the instructions for each medium for the comparison values appropriate to that medium.) Calculate the ratio to be listed on the Worksheet by dividing the maximum concentration by the comparison value. Select only those contaminants having reliable analytical data, using the most recent sampling and analysis data which is **representative of the site**.

Sum the column of ratio values to obtain the total value (Figures 8 and 9). Where a lengthy series of analyses has been carried out, it is not necessary to list every contaminant found. However, **the Worksheet should include all contaminants of concern that are attributable to the site**, especially those that produce the highest ratios of observed concentrations to their comparison values. The highest ratios do not necessarily result from contaminants with the highest concentrations. Extremely carcinogenic or toxic compounds may have very low comparison values and therefore result in the highest ratios.

The existence of high ratio values will lead to a higher rating for the CHF. Note that the CHF is *significant* when the sum of the ratios exceeds 100. Every attempt should be made to include all contaminants of concern

present at a site for the CHF calculation in order to be able to compare current site evaluations with future ones.

In selecting contaminants with reliable analytical data, review the contaminants that have been detected in the medium and that can be reasonably attributed to the site. Attribution implies that the contaminant concentrations are distinguishable from background concentrations. **Do not include naturally occurring compounds that are detected within established background concentration ranges.** Additionally, if all analytical data are within established background ranges for a medium or site, automatically assign that medium or site a rating of *Low*. All contaminants that have been reliably reported at concentrations near or above the detection limit can be included.

For contaminants with reliable analytical data, record only the maximum concentration found in the medium for each contaminant. The contaminants need not have been detected at the same location, but contaminant data should be recent and representative of conditions at the site. Additional considerations specific to each medium are discussed in the instructions for that medium.

3.4 Evaluation of Groundwater

The evaluation of the groundwater medium is summarized in Figure 4. Groundwater contaminant data used in site evaluations must be based on groundwater samples affected by the site. The sampling location need not be on installation property, but contamination must be attributable to the site. The groundwater sample location (i.e., a well) may be a source of drinking water or irrigation water, or it may be a monitoring well. A well that is confirmed to be upgradient from the site **does not** provide suitable data for this evaluation.

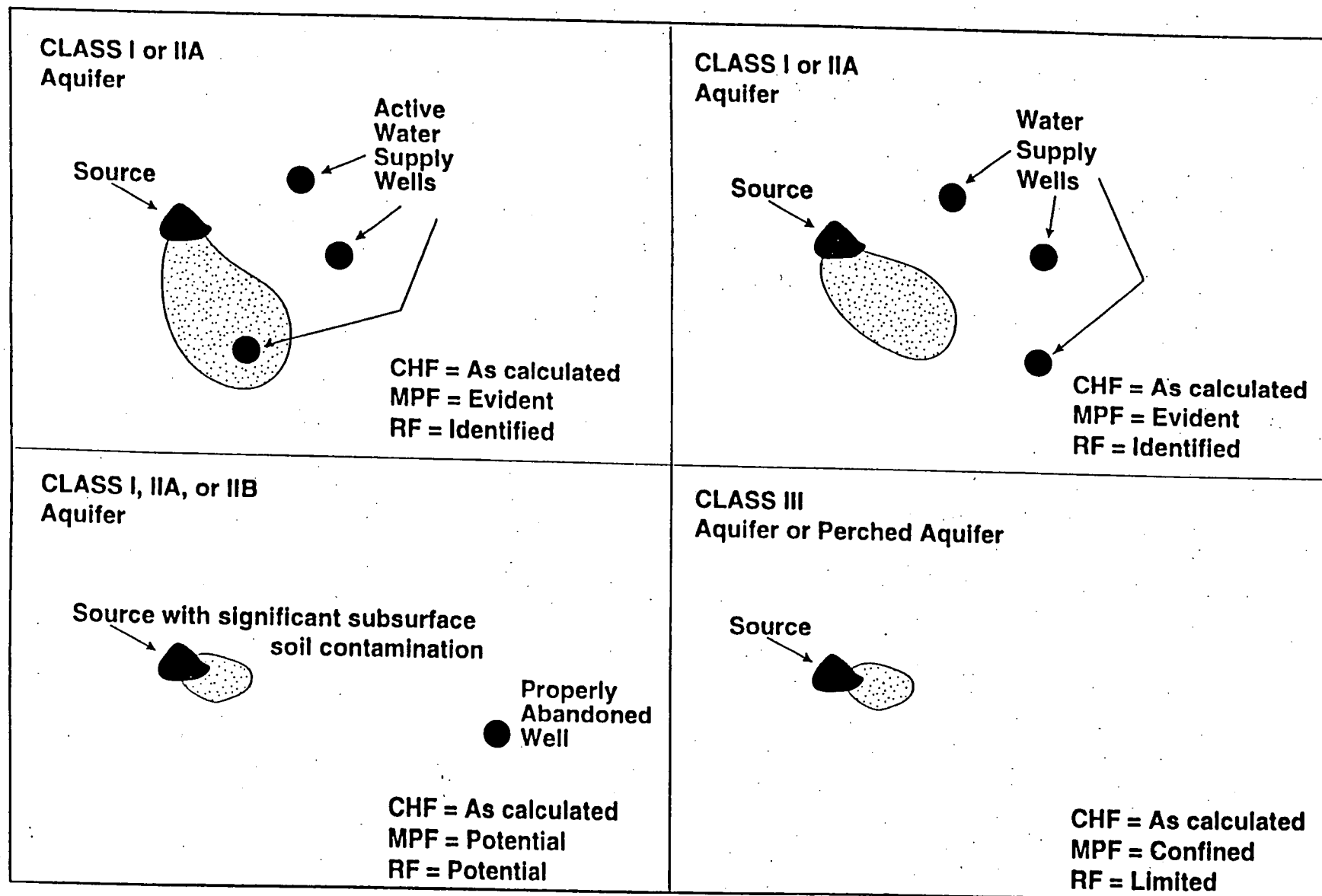


Figure 10. Example Scenarios for the Groundwater Medium

are distinguishable from background concentrations. Samples collected from surface streams, drainage ditches, rivers, lakes, wetlands, and embayments are all appropriate. Samples do not have to be collected adjacent to the site, but greater distances often make attribution to the site more difficult, and dilution from downstream tributaries often reduces observed contaminant concentrations.

For metals in surface water samples, analyses are often available for both the dissolved fraction and the "total" concentration. If they are available, use the data on the dissolved fraction.

Sediment is the result of deposition of solid material from the water. Obtain sediment samples from surface water bodies receiving runoff from the site or from areas such as swales and ditches that are known to have transported water from the site.

For each contaminant listed on the Worksheet, note a maximum detected concentration. Use units of ug/l for water samples and mg/kg for sediment samples. Adjacent to this value record the comparison value for the contaminant using the appropriate subsection of Appendix B.

Migration Pathway Factor (MPF). The likelihood of transport of contaminants via surface water or sediment is evaluated qualitatively as *evident*, *potential*, or *confined* (see Figure 5). Base MPF evaluations on available information and professional judgment. The MPF is *evident* if analytical data or direct observation indicates that contaminants in surface water and sediments are present at a point of exposure for a surface water receptor or have moved in surface water or sediments away from the source towards a point of exposure for a surface water receptor. Water or sediment samples can provide the analytical data. Showing the actual movement of

contaminated runoff from a source toward a point of exposure is needed for direct observation (see Figure 11).

The MPF is *potential* in any instance where there is information to suggest contamination could move away from the source toward a point of exposure for a surface water receptor, or has moved slightly beyond the source area (i.e., tens of feet). Where there is insufficient information to support an MPF of *evident* or *confined*, the MPF defaults to *potential*.

Application of the *confined* MPF to a site requires information that transport of contaminants from the source by surface water to a potential point of exposure to a surface water receptor is restricted. Reasons to believe such a condition could exist include the following:

- The site has engineered runoff controls that can effectively interrupt transport of contaminants to surface water.
- Removal or remedial actions have been implemented that restrict the movement of contaminants away from the source.
- The contamination at the source is below the ground surface and is not subject to erosion or interaction with surface water. For example, leaking underground storage tanks may result in subsurface soil and groundwater contamination but not contamination of surface water.
- Topographic conditions prevent surface water from leaving the immediate area of the site. If there is effectively no runoff from the site to surface water, there will be no migration of contaminants to points of exposure. This may also occur in areas with very low rainfall, perhaps with only nearby ephemeral streams. In some areas surface water may be completely lost to groundwater recharge.

Note that the rationale for a *confined* MPF must be based upon hydrologic factors; water must be prevented from coming into contact with contaminated sources or moving to a potential point of exposure for a surface water receptor. The chemical or physical characteristics of the contaminants, although important in determining transport mechanisms, will not in themselves prevent such transport. The chemical and physical properties of a contaminant may determine whether it will be transported primarily in a dissolved form or adsorbed on particulate matter, but if the contaminant is in contact with surface water and subject to erosive forces, it will tend to move. Further, the existence of manmade structures, such as dams, or the presence of lakes and reservoirs in the surface water pathway does not necessarily imply a *confined* condition. Although the travel time for the contaminants will undoubtedly be affected by such structures, the migration pathway may still be uninterrupted.

Receptor Factor (RF). Receptors could be subject to a number of exposure scenarios associated with surface water and sediment. Surface water can be a source of drinking water and is often used for recreational activities such as boating, swimming, and fishing. Human exposure could occur through the use of surface water for drinking water, the incidental ingestion of surface water during recreational activity, dermal contact with surface water or sediments, ingestion of aquatic species caught in the water body for human consumption, and the use of surface water for watering livestock or irrigation of human food crops. Aquatic species, considered part of the human food chain, could potentially include fresh and marine species, such as finfish, shellfish, shrimp, squid, snails, and crayfish. Ecological receptors to be considered are restricted to those areas specifically identified in Table 2.

The RF can be *identified*, *potential*, or *limited* (see Figure 5). Rate the RF as *identified* whenever receptors have been specifically identified as having access to surface water or sediment to which the contaminants have moved or can move. This could potentially include the use of water as drinking water, for irrigating human food crops, for watering livestock, and for supporting recreational activity, including fishing. It could also include the presence of ecological areas downstream from the site and within the surface water migration pathway (see Figure 11).

The RF is *potential* if there are no known uses of surface water as outlined above, but the potential for such use is thought to exist because of nearby populations or predicted future development.

The RF is *limited* when it is unlikely that human population will come into contact with the water or sediment and when there are no ecological receptors apparent. These conditions, as they apply to humans, may be met in remote areas or areas in which access is highly restricted.

3.6 Evaluation of Surface Soils

Samples for the soil evaluation should be from a depth of 0 to 6 inches. If samples are not available from this interval, samples from depths up to 24 inches can be used. Preference is given to shallower samples when there is a choice. In no instance should samples deeper than 24 inches be used. For the purpose of this evaluation, the hazard posed by subsurface soil contaminants (e.g., a buried leaking storage tank deeper than 24 inches) is assumed to be assessed by the evaluation of groundwater (based on actual groundwater sampling data), which would be the most probable pathway of deep soil contaminant migration to humans.

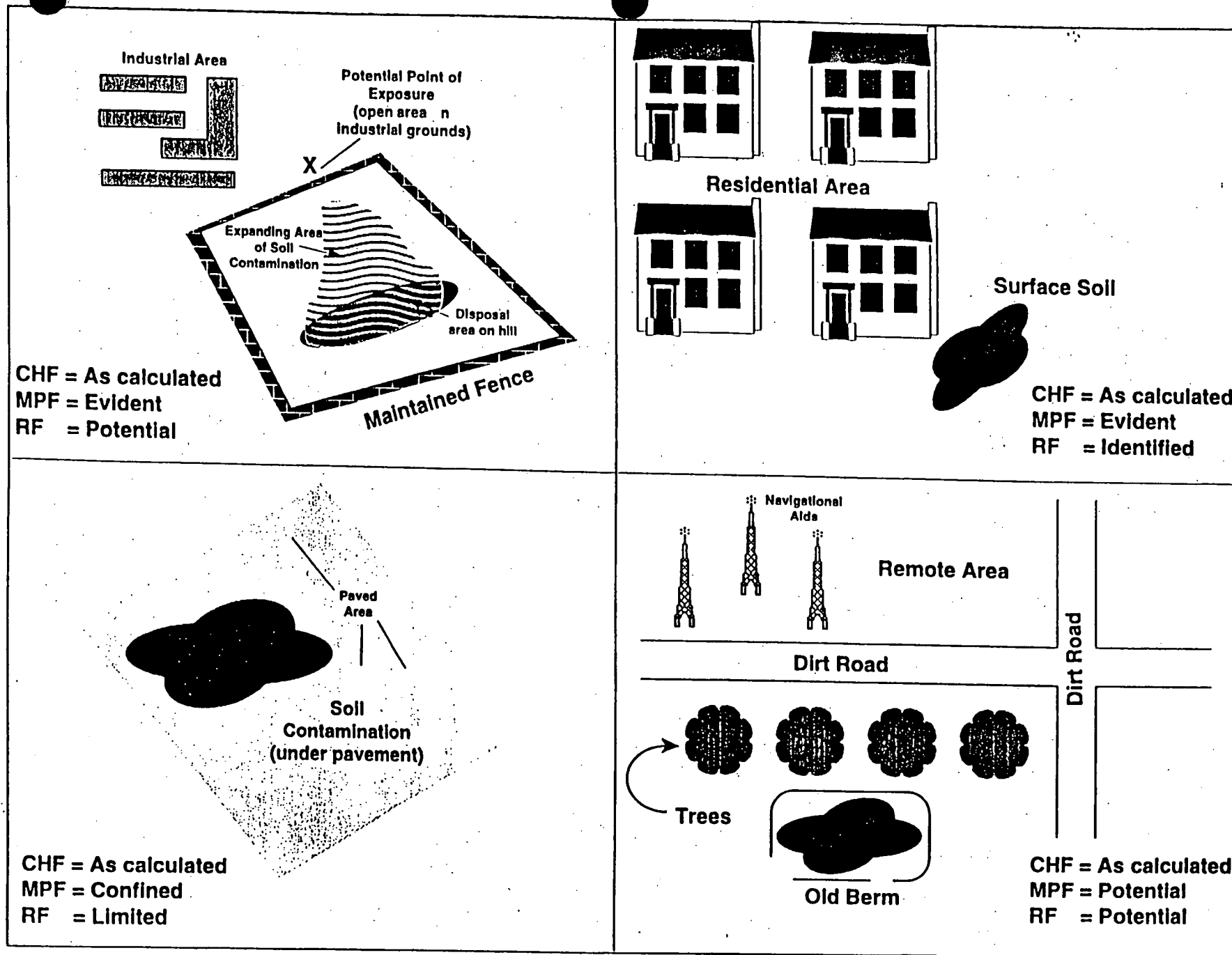


Figure 12. Example Scenarios for the Soil Medium

4 Terms and Definitions

Base Realignment and Closure (BRAC)	Refers to policy, procedures, authorities, and responsibilities for closing or realigning military installations across the Department of Defense. Includes environmental restoration activities.
Baseline Risk Assessment	An analysis of the potential adverse health effects (current or future) caused by contaminant releases from a site in the absence of any actions to control or mitigate these releases.
Cancer Risk	Incremental probability of an individual developing cancer over a lifetime as a result of exposure to a carcinogen.
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)	CERCLA, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, establishes a comprehensive framework for identifying, investigating, and cleaning up releases of hazardous substances to the environment. CERCLA authorizes the President to take response actions when a release or the threat of a release is discovered. Through Executive Order 12580, signed in January 1987, the President directs the Secretary of Defense to implement investigation and cleanup measures in consultation with EPA for releases of hazardous substances from facilities under the jurisdiction of the Secretary.
Defense Environmental Restoration Account (DERA)	A transfer account, established by the Defense Appropriation Act of 1984, that funds the Installation Restoration Program for active installations and the Formerly Used Defense Sites Program for formerly owned or used installations. The account also funds the other goals of the Defense Environmental Restoration Program.
Defense Environmental Restoration Program (DERP)	A program established by Congress in 1984 to evaluate and clean up contamination from past DoD activities (Title 10 U.S. Code 2701-2707 and 2810.)
Defense Site Environmental Restoration Tracking System (DSERTS)	The Defense Site Environmental Restoration Tracking System (DSERTS) is a personal computer program used by installation and command level restoration program managers. It automates collection and reporting of information on sites addressed by the Defense Environmental Cleanup Programs (Installation Restoration and Base Realignment and Closure).
Exposure Point	A location of potential contact between a receptor and a chemical or physical agent.

Preliminary Assessment (PA)	A limited-scope investigation designed to distinguish between sites that pose little or no threat to human health and the environment and sites that require further investigation. The PA is typically based on installation record searches, visual site inspections, and interviews of site personnel. It is required at sites listed on the Federal Facility Hazardous Waste Compliance Docket.
Preliminary Remediation Goals (PRGs)	Relative risk PRGs are concentration levels set for individual chemicals that, for carcinogens, correspond to a specific cancer risk level of 1 in 1 million and, for noncarcinogens, correspond to a Hazard Quotient of 1. They are generally selected when Applicable or Relevant and Appropriate Requirements (ARARs) are not available.
RCRA Facility Assessment (RFA)	The first step in the RCRA corrective action process. The RFA acts as a screen, first identifying and then eliminating solid waste management units (SWMUs), environmental media, or entire facilities from further consideration for corrective action. RFAs are performed as part of the RCRA permitting process.
Receptor	A human individual or individuals, ecological population, or sensitive environment subject to, or potentially subject to, the hazard of contaminant exposure. Sensitive environments considered as receptors are listed in Table 2.
Reference Dose (RfD)	An estimated daily exposure level of a contaminant to a human population below which no adverse noncancer health effects are anticipated.
Relative Risk	The grouping of sites in DERP into High, Medium, and Low categories based on an evaluation of site information using three key factors: the contaminant hazard factor (CHF), the migration pathway factor (MPF), and the receptor factor (RF).
Remedial Action (RA)	Involves the construction, operation, and implementation of the final cleanup remedy. Long-term RAs require continued monitoring, operation, and maintenance for a number of years.
Remedial Action Operation (RAO)	A site status classification that applies after all remedies are in place, but before a response complete decision is made.
Remedial Design (RD)	Involves the development of the actual design of the selected cleanup remedy, including preparation of all technical drawings and specifications needed to implement the cleanup action.

Site	A discrete area where contamination has been verified, requiring further response action. By definition, a site has been or will be entered into RMIS. For the Formerly Utilized Defense Sites (FUDS) program, a <i>site</i> is equivalent to a "project" and an <i>installation</i> is equivalent to a "FUDS Property." Hence, there may be multiple projects on a single FUDS property.
Site Inspection (SI)	Performed if the PA recommends further investigation. SI investigations typically collect waste and environmental samples to determine the hazardous substances present at a site and whether they are being released to the environment.
Slope Factor (SF)	A plausible upper-bound estimate of the probability of a response per unit intake of a chemical over a lifetime. The slope factor is used to estimate an upper-bound probability of an individual developing cancer as a result of a lifetime of exposure to a particular level of a carcinogen.
Source	Area where hazardous substances or petroleum products have been deposited, stored, released, disposed of, or placed.

5 References

- Department of the Air Force, *Use of Risk-Based Standards for Cleanup of Petroleum Contaminated Soil*, June 1994.
- General Accounting Office, *Environmental Cleanup: Too Many High Priority Sites Impede DoD's Program*, 3 May 1994.
- Goodman, Sherri Wasserman, Deputy Under Secretary of Defense (Environmental Security), *Statement before the U.S. Senate Committee on Energy and Natural Resources*, 9 November 1993.
- Long, Edward R., and Lee G. Morgan, *The Potential for Biological Effects of Sediment-Sorbed Contaminants Tested in the National Status and Trends Program*, National Oceanic and Atmospheric Administration Technical Memorandum NOS OMA 52, 1990.
- Office of the Deputy Under Secretary of Defense (Environmental Security), *Annual Report to Congress for Fiscal Year 1994 for the Defense Environmental Restoration Program*, 31 March 1995.
- Office of the Deputy Under Secretary of Defense (Environmental Security), *Management Guidance for Execution of the FY94/95 and Development of the FY96 Defense Environmental Restoration Program*, 14 April 1994. This document is available through the Cleanup Program Office at (703) 697-7475.
- U.S. Environmental Protection Agency, Office of Groundwater Protection, *Guidelines for Groundwater Classification Under the EPA Groundwater Protection Strategy*, 1986.
- U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, *Guidance on Remedial Actions for Contaminated Ground Water at Superfund Sites*, Directive 9283.1-2, December 1988.
- U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, *Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions*, Directive 9355.0-30, April 1991.
- U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, *The Hazard Ranking System Guidance Manual*, Directive 9345.1-07, Interim Final, November 1992. Section A.4 of this document contains sources of information for identifying sensitive environments listed in Table 2 of this Primer. Copies of this section can be obtained by calling the Cleanup Program Office at (703) 697-7475 or through the National Technical Information Service at 1-800-553-NTIS.

6 List of Acronyms and Abbreviations

ARAR	Applicable or Relevant and Appropriate Requirements
BRAC	Base realignment and closure
BTEX	Benzene, Toluene, Ethylbenzene, and Xylene
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CAS	Chemical Abstracts Service
CHF	Contaminant Hazard Factor
CHHPM	Center for Human Health and Preventative Medicine
DERA	Defense Environmental Restoration Account
DERP	Defense Environmental Restoration Program
DLA	Defense Logistics Agency
DSERTS	Defense Site Environmental Restoration Tracking System
DoD	Department of Defense
DUSD(ES)	Deputy Under Secretary of Defense (Environmental Security)
EPA	U.S. Environmental Protection Agency
ER-L	Environmental Response-Low
FS	Feasibility Study
FUDS	Formerly Used Defense Sites
FY	Fiscal Year
GAO	Government Accounting Office
GW	Groundwater
HEAST	Health Effects Assessment Summary Tables
HSWA	Hazardous and Solid Waste Amendments
ID	Identification
IRA	Interim Remedial Action
IRIS	Integrated Risk Information System
IRP	Installation Restoration Program
LOEL	Lowest Observed Effects Level
LTM	Long-Term Monitoring
mg/kg	Milligrams per kilogram
MPF	Migration Pathway Factor



Office of the Deputy Under Secretary of Defense
(Environmental Security)

Defense Environmental Cleanup Program Fact Sheet

The Relative Risk Site Evaluation Concept

Introduction

The Department of Defense (DoD) considers environmental restoration as an integral part of its daily mission activities. At installations around the country, environmental restoration activities are underway to address contamination resulting from past DoD operations. Environmental analysis and cleanup activities address a wide variety of sites contaminated with fuels, solvents, chemicals, heavy metals, and common industrial materials.

Given the large number of sites to be addressed and limitations on money and people to work on these sites each year, DoD believes that a risk-based approach should be applied to work sequencing at active military installations, Base Realignment and Closure (BRAC) installations, and formerly used defense properties using relative risk as a key factor. The relative risk site evaluation framework described in this fact sheet provides a means of helping accomplish this objective.

The framework for evaluating site relative risk was published in September 1994, in the *Relative Risk Site Evaluation Primer (Interim Edition)* which contained instructions for performing relative risk site evaluations at sites across DoD. A revised edition of the Primer was issued in June 1996.

Definition of Relative Risk Site Evaluation

The relative risk site evaluation framework is a methodology used by all DoD Components to evaluate the relative risk posed by a site in relation to other sites. It is a tool used across all of DoD to group sites into high, medium, and low categories based on an evaluation of site information using three factors: the contaminant hazard factor (CHF), the migration pathway factor (MPF), and the receptor factor (RF). Factors are based on a quantitative evaluation of contaminants and a qualitative evaluation of pathways and human and ecological receptors in the four media most likely to result in significant exposure—groundwater, surface water, sediment, and surface soils. A representation of this evaluation concept is presented in Figures 1 and 2. Figure 1 also depicts possible opportunities for stakeholder input into the technical evaluation.

The relative risk site evaluation framework is a qualitative and easy to understand methodology for evaluating the relative risks posed by sites and should not be equated with more formal risk assessments conducted to assess baseline risks posed by sites. It is a tool to assist in sequencing environmental restoration work (i.e., known requirements such as remedial investigation or cleanup actions) to be done by a DoD Component. It is designed to handle the broad range of sites that exist at DoD installations and the broad range of data available. The grouping of sites into high,

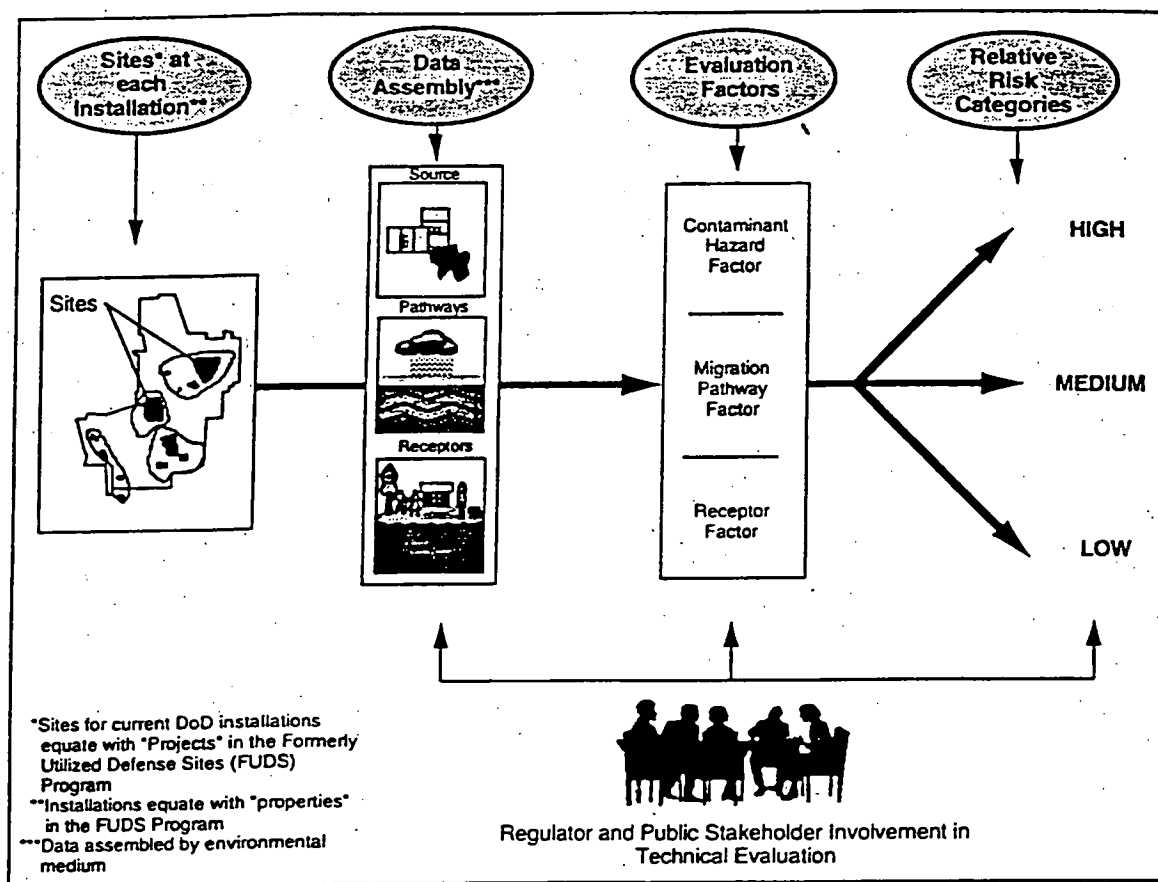


Figure 1. Relative Risk Site Evaluation Concept Summary

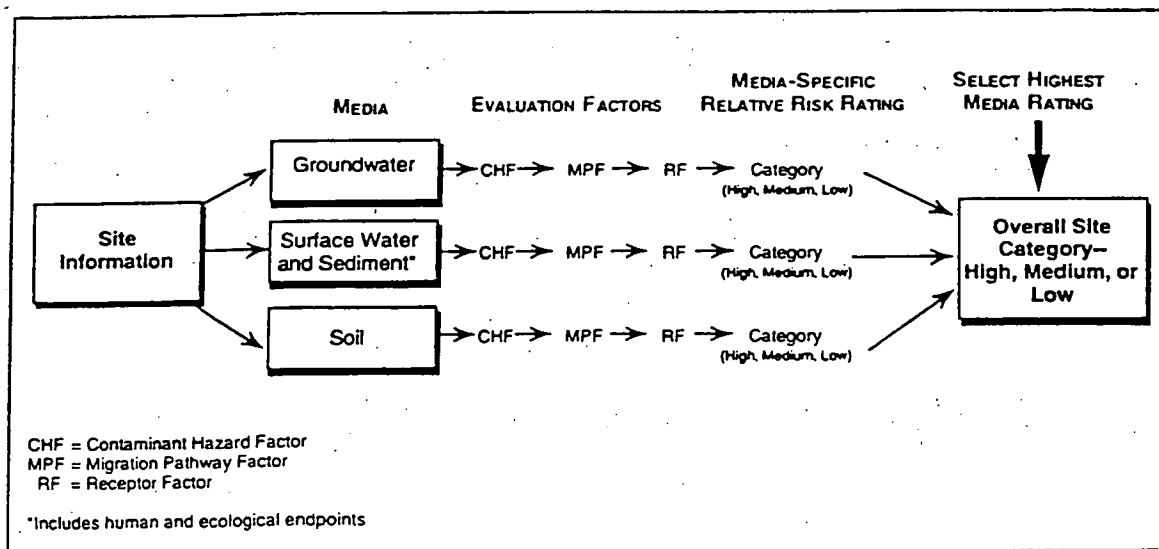


Figure 2. Flow Diagram of the Relative Risk Site Evaluation Framework

medium, or low relative risk categories is not a substitute for either a baseline risk assessment or health assessment; it is not a means of placing sites into a Response Complete/No Further Action category; and it is not a tool for justifying a particular type of action (e.g., the selection of a remedy).

Use of the relative risk site evaluation framework is restricted to environmental restoration sites and does not extend to unexploded ordnance (UXO) removal, building demolition/debris removal (BD/DR), potentially responsible party (PRP) activities, or compliance activities.

Relative Risk and Funding Decisions

Relative risk is not the sole factor in determining the sequence of environmental restoration work, but it is an important consideration in the priority setting process. It should be factored into all priority setting decisions, and should be discussed with regulators and public stakeholders in the environmental restoration process.

The actual funding priority for a site is identified after relative risk information is combined with other important risk management considerations (e.g., the statutory and regulatory status of a particular installation or site, public stakeholder concerns, program execution considerations, and economic factors). These additional risk management considerations can result in a decision to fund work at a site that is not classified as a high relative risk. DoD Components have each developed guidelines for combining relative risk and risk management considerations as part of their planning, programming, and budgeting process.

The relative risk site evaluation framework does not address the question of whether work is necessary at a site; it only provides information for use in helping to determine the general sequence in which sites will be addressed. At the DoD headquarters level, it

also provides a framework for planning, programming, and budgeting requirements, a topic discussed below.

Requirements for Relative Risk Site Evaluations

Relative risk site evaluations are required for all sites at active military installations, BRAC installations, and formerly used defense properties that have future funding requirements that are not classified as (1) having "all remedies in place," (2) "response complete," (3) lacking sufficient information, or (4) abandoned ordnance. These four situations are discussed in the following four paragraphs.

Relative risk site evaluations are not required (NR) for sites classified as having all remedies in place (RIP) even though they may be in remedial action operation (RAO) or long-term monitoring (LTM). A RIP determination requires that remedial action construction is complete for a site.

Relative risk site evaluations are not required (NR) for sites classified as response complete (RC). Sites classified as RC are those where a DoD Component deems that no further action (NFA) is required with the possible exception of LTM. An RC determination requires that one of the following apply: (1) there is no evidence that contaminants were released at the site, (2) no contaminants were detected at the site other than at background concentrations, (3) contaminants attributable to the site are below action levels used for risk screening, (4) the results of a baseline risk assessment demonstrate that cumulative risks posed by the site are below established thresholds, or (5) removal and/or remedial action operations (RAOs) at a site have been implemented, completed, and are the final action for the site. Only LTM remains.

Relative risk site evaluations should be based on the information currently available on contaminants, migration pathways, and receptors. Sites lacking sufficient information

for the conduct of a relative risk site evaluation should be given a "Not Evaluated" designation and should then be programmed for additional study, a removal action if warranted, or other appropriate response action, including deferral, before they are evaluated.

Sites comprised solely of abandoned ordnance are not subject to the relative risk site evaluation described in this Primer. Such sites should be evaluated using a separate risk procedure, which is discussed in the management guidance cited above (Office of the Under Secretary of Defense [Environmental Security], 1994).

Implementation of the Relative Risk Site Evaluation Framework

DoD's goal is to conduct relative risk site evaluations at the field level with the involvement of the regulators and public stakeholders (see Figure 1). The technical evaluation of sites using the evaluation framework can serve as a basis for discussion and negotiation with regulators and public stakeholders. In particular, regulators and public stakeholders can help identify receptors, and can make judgments about the extent of contaminant migration in various environmental media at a site. Where they exist, Restoration Advisory Boards (RABs) are an excellent forum for obtaining public stakeholder input on these aspects of site relative risk. Other opportunities for public stakeholder involvement may also be appropriate. Regulators and public stakeholders should always be given the opportunity to participate in the development and review of relative risk site evaluation data before the data is used in planning and programming.

Management Uses of Relative Risk Information

DoD and DoD Components are using the relative risk site evaluation framework as a tool to help sequence work at sites and as a headquarters program management tool. As a

program management tool, the framework is being used by DoD and DoD Components to periodically identify the distribution of sites in each of three relative risk categories—high, medium, and low. A series of discrete relative risk site evaluations provides headquarters program managers with a macro-level view of changes in relative risk distributions within DoD over time.

The relative risk site evaluation framework and resulting data also provide DoD with a basis for establishing goals and performance measures for the environmental restoration program. In this regard, DoD has established goals for all DoD Components to reduce relative risk at sites in Defense Environmental Restoration Account (DERA) and BRAC programs or to have remedial systems in place where necessary for these sites, within the context of legal agreements. DoD and DoD Components are tracking progress towards these relative risk reduction goals as one of several program measures of merit (MOMs) at the headquarters level. Another MOM tracks the number of sites where cleanup action has been taken and relative risk has been reduced in one or more media. Resultant information is used to provide the necessary feedback to develop and adjust program requirements and budget projections, as well as to assess whether established goals reflect fiscal reality.

For More Information

At the Installation, contact

At DoD Headquarters, contact the Office of the Deputy Under Secretary of Defense (Environmental Security - Cleanup) at 703/697-7475.

APPENDIX D
QUANTITATIVE SITE RANKINGS

RELATIVE RISK EVALUATION WORKSHEET

SITE (1) BACKGROUND INFORMATION

Installation/Site Name for FUDS: WILLOW GROVE PA NAS

Date Entered (Day, Month, Year): 10/28/04

Location (State): PA

Media Evaluated (GW, SW, Sediment, Soil): GW SOIL SWH SWEF SEDH

Site (Name/RMIS ID) / Project for FUDS: SITE 00001

Phase of Exec. (SI, RI, FS, Remv, RD/RA, or equiv. RCRA Stage): RI

RMIS Site Type: STORAGE AREA

Agr. Status (Y/N, If yes, type of agreement e.g., FFA, Permit, Order): Yes

Point of Contact (Name/Phone): JIM EDMOND

National Priority List (Y/N): Yes Site Rank: High

SITE SUMMARY

(Include only key elements of information used to conduct the relative risk site evaluation. Attach map view of site if desired.)

Brief Site Description (Include site type, materials disposed of, dates of operation, and other relevant information):

The privet road compound consists of a fenced area approximately 1/2 acre in size located immediately east of Privet Road and across from building 6. This area was constructed to serve as a transfer station for wastes after closure of the 9th street landfill in 1967 and 1995, the area was used as an open disposal area where appreciable quantities of wastes were burned and buried.

Brief Description of Pathways (Groundwater, Surface Water, Sediment, Soil):

Pathways to be considered at Site 1 include on site ground water and surface soils. The pathway for the onsite ground water consists of ingestion of the water through the potable water supply wells located on the facility. For the onsite surface and subsurface soils, the pathway is through direct dermal contact.

Brief Description of Receptors (Human and Ecological):

Receptors include current on site workers ingesting potable water.

(1) Use to record information on Sites and Areas of Concern (AOC) for Relative Risk Site Evaluation. The term Site is defined as a discrete area for which suspected contamination has been verified and requires a Site by definition has been, or will be, entered into RMIS. For the FUDS Program, "projects" equates to sites for current installations. An AOC is a discrete area of contamination, or suspected contamination in (or RFA) phase that has not been entered into RMIS.

Ground Water

CONTAMINANT HAZARD FACTOR (1) (CHF)

Contaminant	Maximum Conc. ug/L	Standard ug/L	Ratio (2)
Lead	39.8	4.0	9.950
Calcium	53,200.0	11,000.0	4.840
Antimony and compounds	45.0	15.0	3.000
Manganese and compounds	4,930.0	1,700.0	2.900
Arsenic (cancer endpoint)	8.8	4.5	1.960
Aluminum	27,800.0	37,000.0	0.750
Barium and compounds	1,160.0	2,600.0	0.450
Carbon tetrachloride	7.0	17.0	0.410
Vanadium	43.0	260.0	0.170
Trichloroethylene (TCE)	18.0	160.0	0.110
Total:			24.857

(1) Evaluate for human contaminants only
(2) Ratio = Maximum Concentration/Standard
Note: Only top ten contaminants are displayed.

(Place an "X" next to one below)

Significant (If Total > 100): _____

Moderate (If Total 2 - 100): X

Minimal (If Total < 2): _____

MIGRATION PATHWAY FACTOR (MPF)

Evident - Analytical data or observable evidence indicates that contamination in the media is moving away from the source.

Confined - Information indicates that the potential for contaminant migration from the source is limited (due to geological structures or physical controls)

(Place an "X" next to one below)

Evident: X

Potential: _____

Confined: _____

Potential - Possibility for contamination to be present at or migrate to a point of exposure; or information is not sufficient to make a determination of Evident or Confined

Brief Rationale for Selection: GW contamination confirmed.

RECEPTOR FACTOR (RF)

Identified - There is a threatened or potentially threatened water supply downgradient of the source. The GW (cont. or not) is a current drinking water source or is equiv. to (Class I or IIA aquifer).

Limited - There is no potentially threatened water supply well downgradient of the source. The groundwater is not considered a potential source of DW or is of limited beneficial use (IIIA, IIIB or perched aquifer).

(Place an "X" next to one below)

Identified: X

Potential: _____

Limited: _____

Potential - There is no potentially threatened water supply well downgradient of the source. The groundwater is potentially usable for DW, irrigation or agriculture, but not presently used (Class IIB aquifer).

Brief Rationale for Selection: Base drinking wells in vicinity.

Activity Name: WILLOW GROVE PA NAS

Site Name: SITE 00001

Groundwater Category: High
(High, Medium, Low)

Soil

CONTAMINANT HAZARD FACTOR (1) (CHF)

Contaminant	Maximum Conc. mg/Kg	Standard mg/Kg	Ratio (2)
Lead	149.0	400.0	0.370
Cadmium and compounds	5.8	37.0	0.160
Vanadium	47.8	520.0	0.090
Dieldrin	0.08	2.8	0.030
Barium and compounds	129.0	5,200.0	0.020
Copper and compounds	44.0	2,800.0	0.020
Nickel and compounds	19.6	1,500.0	0.010
Chromium (total)	37.2	3,000.0	0.010
Zinc	200.0	22,000.0	0.010
Silver and compounds	3.0	370.0	0.010
Total:			0.737

(1) Evaluate for human contaminants only
(2) Ratio = Maximum Concentration/Standard
Note: Only top ten contaminants are displayed.

(Place an "X" next to one below)

Significant (If Total > 100): _____

Moderate (If Total 2 - 100): _____

Minimal (If Total < 2): X

MIGRATION PATHWAY FACTOR (MPF)

Evident - Analytical data or observable evidence indicates that contamination is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination to be present at or migrate to a point of exposure; or information is not sufficient to make a determination of Evident or Confined

Confined - Low possibility for contamination to be present at or migrate to a point of exposure

(Place an "X" next to one below)

Evident: _____

Potential: _____

Confined: X

Brief Rationale for Selection:

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to contaminated soil

Potential - Potential for receptors to have access to contaminated soil

Limited - Little or no potential for receptors to have access to contaminated soil

(Place an "X" next to one below)

Identified: _____

Potential: _____

Limited: X

Brief Rationale for Selection:

Activity Name: WILLOW GROVE PA NAS

Site Name: SITE 00001

Soil Category: Low
(High, Medium, Low)

Surface Water Eco Fresh

**CONTAMINANT
HAZARD
FACTOR (1)
(CHF)**

Contaminant	Maximum Conc. ug/L	Standard ug/L	Ratio (2)
Calcium	42,000.0	110.0	381.820
Zinc	194.0	110.0	1.760
Lead	5.2	3.2	1.630
Antimony and compounds	47.0	30.0	1.570
Methyl isobutyl ketone	220.0		
Aluminum	1,400.0		
Chromium (total)	10.0		
Barium and compounds	37.0		
Manganese and compounds	41.0		
Acetone	1,300.0		
Total:			386.773

(1) Evaluate for human contaminants only
(2) Ratio = Maximum Concentration/Standard
Note: Only top ten contaminants are displayed.

(Place an "X" next to one below)

Significant (If Total > 100): X

Moderate (If Total 2 - 100):

Minimal (If Total < 2):

**MIGRATION
PATHWAY
FACTOR
(MPF)**

Evident -

Analytical data or observable evidence indicates that contamination in the media is present at, is moving toward, or has moved to a point of exposure

Confined -

Information indicates a low potential for contamination to a potential point of exposure (could be due to the presence of geological structures or physical controls)

(Place an "X" next to one below)

Evident:

Potential:

Confined: X

Potential -

Possibility for contamination to be present at or migrate to a point of exposure; or information is not sufficient to make a determination of Evident or Confined

Brief Rationale for Selection:

**RECEPTOR
FACTOR
(RF)**

Identified -

Receptors identified that have access to surface water

Limited -

Little or no potential for receptors to have access to surface water

(Place an "X" next to one below)

Identified:

Potential:

Limited: X

Potential -

Potential for receptors to have access to surface water

Brief Rationale for Selection:

Activity Name: WILLOW GROVE PA NAS

Site Name: SITE 00001

Surface Water Fresh Category: Low
(High, Medium, Low)

Sediment Human

CONTAMINANT HAZARD FACTOR (1) (CHF)

Contaminant	Maximum Conc. mg/Kg	Standard mg/Kg	Ratio (2)
Manganese and compounds	1,280.0	3,100.0	0.410
Calcium	9,220.0	23,000.0	0.400
Arsenic (cancer endpoint)	7.8	21.0	0.370
Aluminum	18,700.0	75,000.0	0.250
Lead	88.6	400.0	0.220
Cadmium and compounds	4.7	37.0	0.130
Vanadium	41.7	520.0	0.080
Dieldrin	0.21	2.8	0.080
Barium and compounds	167.0	5,200.0	0.030
Nickel and compounds	22.3	1,500.0	0.010
Total:			2.029

(1) Evaluate for human contaminants only
(2) Ratio = Maximum Concentration/Standard
Note: Only top ten contaminants are displayed.

(Place an "X" next to one below)

Significant (If Total > 100): _____

Moderate (If Total 2 - 100): X

Minimal (If Total < 2): _____

MIGRATION PATHWAY FACTOR (MPF)

Evident - Analytical data or observable evidence indicates that contamination in the media is present at, is moving toward, or has moved to a point of exposure

Potential - Possibility for contamination to be present at or migrate to a point of exposure; or information is not sufficient to make a determination of Evident or Confined

Confined - Information indicates a low potential for contamination to a potential point of exposure (could be due to the presence of geological structures or or physical controls)

(Place an "X" next to one below)

Evident: _____

Potential: X

Confined: _____

Brief Rationale for Selection:

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to sediment

Potential - Potential for receptors to have access to sediment

Limited - Little or no potential for receptors to have access to sediment

(Place an "X" next to one below)

Identified: _____

Potential: X

Limited: _____

Brief Rationale for Selection:

Activity Name: WILLOW GROVE PA NAS

Site Name: SITE.00001

Sediment Human Category: Med
(High, Medium, Low)

Sediment Eco Marine

**CONTAMINANT
HAZARD
FACTOR (1)
(CHF)**

Contaminant	Maximum Conc. mg/Kg	Standard mg/Kg	Ratio (2)
Dieldrin	0.21	0.0	10500.000
Calcium	9,220.0	120.0	76.830
Lead	88.6	35.0	2.530
Zinc	124.0	120.0	1.030
Cadmium and compounds	4.7	5.0	0.940
Nickel and compounds	22.3	30.0	0.740
Copper and compounds	36.1	70.0	0.520
Chromium (total)	31.8	80.0	0.400
Arsenic (cancer endpoint)	7.8	33.0	0.240
Vanadium	41.7		
Total:			10583.231

(1) Evaluate for human contaminants only
(2) Ratio = Maximum Concentration/Standard
Note: Only top ten contaminants are displayed.

(Place an "X" next to one below)

Significant (If Total > 100): X

Moderate (If Total 2 - 100):

Minimal (If Total < 2):

**MIGRATION
PATHWAY
FACTOR
(MPF)**

- Evident -** Analytical data or observable evidence indicates that contamination in the media is present at, is moving toward, or has moved to a point of exposure
- Potential -** Possibility for contamination to be present at or migrate to a point of exposure; or information is not sufficient to make a determination of Evident or Confined

Confined - Information indicates a low potential for contamination to a potential point of exposure (could be due to the presence of geological structures or or physical controls)

(Place an "X" next to one below)

Evident:

Potential:

Confined:

Brief Rationale for Selection:

**RECEPTOR
FACTOR
(RF)**

- Identified -** Receptors identified that have access to sediment
- Potential -** Potential for receptors to have access to sediment

Limited - Little or no potential for receptors to have access to sediment

(Place an "X" next to one below)

Identified:

Potential:

Limited:

Brief Rationale for Selection:

Activity Name: WILLOW GROVE PA NAS

Site Name: SITE 00001

Sediment Marine Category:
(High, Medium, Low)

RELATIVE RISK EVALUATION WORKSHEET

SITE (1) BACKGROUND INFORMATION

Installation/Site Name for FUDS: WILLOW GROVE PA NAS

Date Entered (Day, Month, Year): 6/6/00

Location (State): PA

Media Evaluated (GW, SW, Sediment, Soil): GW SWH SWEF SEDH SEDEM SOIL

Site (Name/RMIS ID) / Project for FUDS: SITE 00002

Phase of Exec. (SI, RI, FS, Remv, RD/RA, or equiv. RCRA Stage): RI

RMIS Site Type: LANDFILL

Agr. Status (Y/N, If yes, type of agreement e.g., FFA, Permit, Order): Yes

Point of Contact (Name/Phone): JIM EDMOND

National Priority List (Y/N): Yes Site Rank: Med

SITE SUMMARY

(Include only key elements of information used to conduct the relative risk site evaluation. Attach map view of site if desired.)

Brief Site Description (Include site type, materials disposed of, dates of operation, and other relevant information):

The antennal field landfill was used between 1948 and 1960 as the exclusive disposal area for solid waste generated by the activity. The site is located near the south end of the facility and southwest of runway 10/28. Landfill activities consisted of trench excavation and subsequent burning and burial of waste material disposed of within the trenches. The size of the landfill is approximately 9 acres.

Brief Description of Pathways (Groundwater, Surface Water, Sediment, Soil):

Pathways to be considered at Site 2 include surface water/sediment. For the surface water/sediment, the pathway is through direct dermal contact.

Brief Description of Receptors (Human and Ecological):

Receptors to be considered at Site 2 include current on site workers adult and child recreational receptors.

(1) Use to record information on Sites and Areas of Concern (AOC) for Relative Risk Site Evaluation. The term Site is defined as a discrete area for which suspected contamination has been verified and requires A Site by definition has been, or will be, entered into RMIS. For the FUDS Program, "projects" equates to sites for current installations. An AOC is a discrete area of contamination, or suspected contamination in (or RFA) phase that has not been entered into RMIS.

Sediment Eco Marine

**CONTAMINANT
HAZARD
FACTOR (1)
(CHF)**

Contaminant	Maximum Conc. mg/Kg	Standard mg/Kg	Ratio (2)
Dieldrin	0.49	0.0	24500.000
Calcium	49,500.0	120.0	412.500
Chrysene	14.0	0.06	233.330
Phenanthrene	27.0	0.225	120.000
Fluorene	3.6	0.035	102.860
Anthracene	6.1	0.085	71.760
Pyrene	24.0	0.35	68.570
Benz(a)anthracene	12.0	0.23	52.170
Fluoranthene	28.0	0.6	46.670
Zinc	4,390.0	120.0	36.580
Total:			25748.404

(1) Evaluate for human contaminants only
(2) Ratio = Maximum Concentration/Standard
Note: Only top ten contaminants are displayed.

(Place an "X" next to one below)

Significant (If Total > 100): X

Moderate (If Total 2 - 100):

Minimal (If Total < 2):

**MIGRATION
PATHWAY
FACTOR
(MPF)**

- Evident -** Analytical data or observable evidence indicates that contamination in the media is present at, is moving toward, or has moved to a point of exposure
- Potential -** Possibility for contamination to be present at or migrate to a point of exposure; or information is not sufficient to make a determination of Evident or Confined

Confined - Information indicates a low potential for contamination to a potential point of exposure (could be due to the presence of geological structures or or physical controls)

(Place an "X" next to one below)

Evident:

Potential: X

Confined:

Brief Rationale for Selection: Chemicals and concentrations shown need to be transferred to the Sediment Eco Fresh Media - with a Migration factor of Potential since contaminants have the potential to migrate to a - point of exposure.

**RECEPTOR
FACTOR
(RF)**

- Identified -** Receptors identified that have access to sediment
- Potential -** Potential for receptors to have access to sediment

Limited - Little or no potential for receptors to have access to sediment

(Place an "X" next to one below)

Identified:

Potential:

Limited: X

Brief Rationale for Selection: Receptor Factor of Limited is to be used under the Sediment Eco Fresh Media as there are n - o Freshwater ecological receptors in the body of water in question.

Activity Name: WILLOW GROVE PA NAS

Site Name: SITE 00002

Sediment Marine Category: Med
(High, Medium, Low)

Sediment Human

CONTAMINANT HAZARD FACTOR (1) (CHF)

Contaminant	Maximum Conc. mg/Kg	Standard mg/Kg	Ratio (2)
Calcium	49,500.0	23,000.0	2.150
Benzo[a]pyrene	12.0	5.6	2.140
Lead	687.0	400.0	1.720
Manganese and compounds	1,240.0	3,100.0	0.400
Antimony and compounds	11.5	30.0	0.380
Copper and compounds	980.0	2,800.0	0.350
Arsenic (cancer endpoint)	6.1	21.0	0.290
Benzo[b]fluoranthene	15.0	56.0	0.270
Nickel and compounds	379.0	1,500.0	0.250
Benz[a]anthracene	12.0	56.0	0.210
Total:			9.530

(1) Evaluate for human contaminants only
(2) Ratio = Maximum Concentration/Standard
Note: Only top ten contaminants are displayed.

(Place an "X" next to one below)

Significant (If Total > 100): _____

Moderate (If Total 2 - 100): X

Minimal (If Total < 2): _____

MIGRATION PATHWAY FACTOR (MPF)

Evident - Analytical data or observable evidence indicates that contamination in the media is present at, is moving toward, or has moved to a point of exposure

Potential - Possibility for contamination to be present at or migrate to a point of exposure; or information is not sufficient to make a determination of Evident or Confined

Confined - Information indicates a low potential for contamination to a potential point of exposure (could be due to the presence of geological structures or or physical controls)

(Place an "X" next to one below)

Evident: _____

Potential: X

Confined: _____

Brief Rationale for Selection: Concentrations shown are combined maximum detections from the Phase 1 RI in 1991 and the Phase 2 RI in 1997. Contaminants have the potential to migrate to a point of exposure.

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to sediment

Potential - Potential for receptors to have access to sediment

Limited - Little or no potential for receptors to have access to sediment

(Place an "X" next to one below)

Identified: _____

Potential: X

Limited: _____

Brief Rationale for Selection: There is a potential for On-site workers to have access to sediments.

Activity Name: WILLOW GROVE PA NAS

Site Name: SITE 00002

Sediment Human Category: Med
(High, Medium, Low)

Surface Water Eco Fresh

**CONTAMINANT
HAZARD
FACTOR (1)
(CHF)**

Contaminant	Maximum Conc. ug/L	Standard ug/L	Ratio (2)
Calcium	52,200.0	110.0	474.550
Dieldrin	0.46	0.002	230.000
Iron	6,100.0	1,000.0	6.100
Lead	10.5	3.2	3.280
Beryllium and compounds	4.0	5.3	0.750
Zinc	27.0	110.0	0.250
Bis(2-ethylhexyl)phthalate (DEHP)	10.0	360.0	0.030
Aluminum	1,890.0		
Chromium (total)	11.0		
Barium and compounds	188.0		
Total:			714.955

(1) Evaluate for human contaminants only
(2) Ratio = Maximum Concentration/Standard
Note: Only top ten contaminants are displayed.

(Place an "X" next to one below)

Significant (If Total > 100): X

Moderate (If Total 2 - 100):

Minimal (If Total < 2):

**MIGRATION
PATHWAY
FACTOR
(MPF)**

Evident -

Analytical data or observable evidence indicates that contamination in the media is present at, is moving toward, or has moved to a point of exposure

Confined - Information indicates a low potential for contamination to a potential point of exposure (could be due to the presence of geological structures or physical controls)

(Place an "X" next to one below)

Evident:

Potential -

Possibility for contamination to be present at or migrate to a point of exposure; or information is not sufficient to make a determination of Evident or Confined

Potential: X

Confined:

Brief Rationale for Selection: Concentrations shown are maximum detections from the Phase 1 RI in 1991 and Phase 2 RI in 1997. Contaminants have the potential to migrate to a point of exposure.

**RECEPTOR
FACTOR
(RF)**

Identified -

Receptors identified that have access to surface water

Limited - Little or no potential for receptors to have access to surface water

(Place an "X" next to one below)

Identified:

Potential -

Potential for receptors to have access to surface water

Potential:

Limited: X

Brief Rationale for Selection: The body of water in question does not contain any Freshwater ecological receptors that would come in contact with chemicals. In addition, maximum detections shown mostly come from one or two locations and do not represent widespread contamination.

Activity Name: WILLOW GROVE PA NAS

Site Name: SITE 00002

Surface Water Fresh Category: Med
(High, Medium, Low)

Surface Water Human

CONTAMINANT HAZARD FACTOR (1) (CHF)

Contaminant	Maximum Conc. ug/L	Standard ug/L	Ratio (2)
Calcium	52,200.0	11,000.0	4.750
Lead	10.5	4.0	2.630
Manganese and compounds	4,150.0	1,700.0	2.440
Dieldrin	0.46	0.42	1.100
Iron	6,100.0	11,000.0	0.550
Arsenic	1.8	4.5	0.400
Barium and compounds	188.0	2,600.0	0.070
Chromium (total)	11.0	180.0	0.060
Beryllium and compounds	4.0	73.0	0.050
Aluminum	1,890.0	37,000.0	0.050
Total:			12.126

(1) Evaluate for human contaminants only
(2) Ratio = Maximum Concentration/Standard
Note: Only top ten contaminants are displayed.

(Place an "X" next to one below)

Significant (If Total > 100): _____

Moderate (If Total 2 - 100): X

Minimal (If Total < 2): _____

MIGRATION PATHWAY FACTOR (MPF)

Evident - Analytical data or observable evidence indicates that contamination in the media is present at, is moving toward, or has moved to a point of exposure

Potential - Possibility for contamination to be present at or migrate to a point of exposure; or information is not sufficient to make a determination of Evident or Confined

Confined - Information indicates a low potential for contamination to a potential point of exposure (could be due to the presence of geological structures or physical controls)

(Place an "X" next to one below)

Evident: _____

Potential: X

Confined: _____

Brief Rationale for Selection: Concentrations shown are combined maximum detections from the Phase 1 RI in 1991 and Phase - 2 RI in 1997. Contaminants have the potential to migrate towards a point of exposure.

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to surface water

Potential - Potential for receptors to have access to surface water

Limited - Little or no potential for receptors to have access to surface water

(Place an "X" next to one below)

Identified: _____

Potential: X

Limited: _____

Brief Rationale for Selection: There is a potential for On-site workers to have access to surface water.

Activity Name: WILLOW GROVE PA NAS

Site Name: SITE 00002

Surface Water Human Category: Med
(High, Medium, Low)

Soil

CONTAMINANT
HAZARD
FACTOR (1)
(CHF)

Contaminant	Maximum Conc. mg/Kg	Standard mg/Kg	Ratio (2)
Iron	63,200.0	22,000.0	2.870
Benzo(a)Pyrene	8.2	5.6	1.460
Arsenic	12.6	21.0	0.600
Manganese and compounds	1,180.0	3,100.0	0.380
Dieldrin	0.57	2.8	0.200
Lead	81.1	400.0	0.200
Benz(a)Anthracene	8.8	56.0	0.160
Indeno(1,2,3-cd)Pyrene	4.9	56.0	0.090
Chromium	179.0	3,000.0	0.060
Nickel (Soluble Salts)	71.2	1,500.0	0.050

(1) Evaluate for human contaminants only
 (2) Ratio = Maximum Concentration/Standard
 Note: Only top ten contaminants are displayed.

Total: 6.094

(Place an "X" next to one below)

Significant (If Total > 100):

Moderate (If Total 2 - 100):

X

Minimal (If Total < 2):

MIGRATION
PATHWAY
FACTOR
(MPF)

Evident - Analytical data or observable evidence indicates that contamination is present at, is moving towards, or has moved to a point of exposure

Confined - Low possibility for contamination to be present at or migrate to a point of exposure

(Place an "X" next to one below)

Evident:

Potential:

Confined:

X

Potential - Possibility for contamination to be present at or migrate to a point of exposure; or information is not sufficient to make a determination of Evident or Confined

Brief Rationale for Selection: Phase 2 RI soil sampling conducted in Aug 1997. Information indicates that there is a low - possibility for detected chemicals to migrate to a point of exposure.

RECEPTOR
FACTOR
(RF)

Identified - Receptors identified that have access to contaminated soil

Limited - Little or no potential for receptors to have access to contaminated soil

(Place an "X" next to one below)

Identified:

Potential:

Limited:

X

Potential - Potential for receptors to have access to contaminated soil

Brief Rationale for Selection: There is a potential for on-site workers to have access to chemicals detected in surface soils.

Activity Name: WILLOW GROVE PA NASSite Name: SITE 00002Soil Category: Low
(High, Medium, Low)

Ground Water

CONTAMINANT HAZARD FACTOR (1) (CHF)

Contaminant	Maximum Conc. ug/L	Standard ug/L	Ratio (2)
Lead	1.5	4.0	0.380
Iron	3,190.0	11,000.0	0.290
Arsenic	1.3	4.5	0.290
Barium and compounds	674.0	2,600.0	0.260
Chromium (total)	23.4	180.0	0.130
Manganese and compounds	66.2	1,700.0	0.040
Aluminum	964.0	37,000.0	0.030
Trichloroethylene (TCE)	2.0	160.0	0.010
Total:			1.421

(1) Evaluate for human contaminants only
(2) Ratio = Maximum Concentration/Standard
Note: Only top ten contaminants are displayed.

(Place an "X" next to one below)

Significant (If Total > 100): _____

Moderate (If Total 2 - 100): _____

Minimal (If Total < 2): X

MIGRATION PATHWAY FACTOR (MPF)

Evident - Analytical data or observable evidence indicates that contamination in the media is moving away from the source.

Confined - Information indicates that the potential for contaminant migration from the source is limited (due to geological structures or physical controls)

(Place an "X" next to one below)

Evident: _____

Potential: X

Confined: _____

Potential - Possibility for contamination to be present at or migrate to a point of exposure; or information is not sufficient to make a determination of Evident or Confined

Brief Rationale for Selection: Phase 2 RI GW Sampling conducted in Aug 1997. Concentrations shown are maximum detections - from 8/97 sampling and supersede previous 1991 results. Information that exists is not sufficient to make a determination of Evident or Confined.

RECEPTOR FACTOR (RF)

Identified - There is a threatened or potentially threatened water supply downgradient of the source. The GW (cont. or not) is a current drinking water source or is equiv. to (Class I or IIA aquifer).

Limited - There is no potentially threatened water supply well downgradient of the source. The groundwater is not considered a potential source of DW or is of limited beneficial use (IIIA, IIIB or perched aquifer).

(Place an "X" next to one below)

Identified: _____

Potential: X

Limited: _____

Potential - There is no potentially threatened water supply well downgradient of the source. The groundwater is potentially usable for DW, irrigation or agriculture, but not presently used (Class IIB aquifer).

Brief Rationale for Selection: Aquifer is a Class I, sole-source but no supply well exists immediately downgradient.

Activity Name: WILLOW GROVE PA NAS

Site Name: SITE 00002

Groundwater Category: Low
(High, Medium, Low)

RELATIVE RISK EVALUATION WORKSHEET

SITE (1) BACKGROUND INFORMATION

Installation/Site Name for FUDS: WILLOW GROVE PA NAS
Location (State): PA
Site (Name/RMIS ID) / Project for FUDS: SITE 00003
RMIS Site Type: LANDFILL
Point of Contact (Name/Phone): JIM EDMOND

Date Entered (Day, Month, Year): 3/23/00
Media Evaluated (GW, SW, Sediment, Soil): GW SWH SWEF SEDH SOIL
Phase of Exec. (SI, RI, FS, Remv, RD/RA, or equiv. RCRA Stage): RI
Agr. Status (Y/N, If yes, type of agreement e.g., FFA, Permit, Order): Yes
National Priority List (Y/N): Yes Site Rank: High

SITE SUMMARY

(Include only key elements of information used to conduct the relative risk site evaluation. Attach map view of site if desired.)

Brief Site Description (Include site type, materials disposed of, dates of operation, and other relevant information):

The 9th street landfill was used as an alternate disposal area following the closing of the antenna field landfill in 1960. The 9th street landfill was closed in 1967. Subsequent to closure, the site was used to handle empty drums, discarded equipment, and transformers containing PCB oil. It was also concluded that due to previous work at the site, the landfill was a potential source of chlorinated hydrocarbon contamination in the ground water.

Brief Description of Pathways (Groundwater, Surface Water, Sediment, Soil):

Pathways to be considered at Site 3 include surface and subsurface soils as well as surface water/sediments. For the on site surface and subsurface soils, the pathway is through direct dermal contact. The other pathway to consider is through direct contact with the surface water and sediments. There are no water supply wells in the area, therefore, ground water is not considered to be a pathway.

Brief Description of Receptors (Human and Ecological):

Receptors to be considered at Site 3 include current on site workers and current adult and child recreational receptors.

(1) Use to record information on Sites and Areas of Concern (AOC) for Relative Risk Site Evaluation. The term Site is defined as a discrete area for which suspected contamination has been verified and requires A Site by definition has been, or will be, entered into RMIS. For the FUDS Program, "projects" equates to sites for current installations. An AOC is a discrete area of contamination, or suspected contamination in (or RFA) phase that has not been entered into RMIS.

Ground Water

**CONTAMINANT
HAZARD
FACTOR (1)
(CHF)**

Contaminant	Maximum Conc. ug/L	Standard ug/L	Ratio (2)
Calcium	57,000.0	11,000.0	5.180
Cadmium and compounds	48.0	18.0	2.670
Lead	7.6	4.0	1.900
Arsenic (cancer endpoint)	7.4	4.5	1.640
Tetrachloroethylene (PCE)	61.0	110.0	0.550
Barium and compounds	431.0	2,600.0	0.170
Manganese and compounds	226.0	1,700.0	0.130
Aluminum	2,480.0	37,000.0	0.070
Chromium (total)	8.0	180.0	0.040
Toluene	6.0	720.0	0.010
Total:			12.382

(1) Evaluate for human contaminants only
(2) Ratio = Maximum Concentration/Standard
Note: Only top ten contaminants are displayed.

(Place an "X" next to one below)

Significant (If Total > 100): _____

Moderate (If Total 2 - 100): X

Minimal (If Total < 2): _____

**MIGRATION
PATHWAY
FACTOR
(MPF)**

Evident - Analytical data or observable evidence indicates that contamination in the media is moving away from the source.

Confined - Information indicates that the potential for contaminant migration from the source is limited (due to geological structures or physical controls)

(Place an "X" next to one below)

Evident: _____

Potential - Possibility for contamination to be present at or migrate to a point of exposure; or information is not sufficient to make a determination of Evident or Confined

Potential: X

Confined: _____

Brief Rationale for Selection: GW contamination confirmed E base boundary off-site contamination is likely.

**RECEPTOR
FACTOR
(RF)**

Identified - There is a threatened or potentially threatened water supply downgradient of the source. The GW (cont. or not) is a current drinking water source or is equiv. to (Class I or IIA aquifer).

Limited - There is no potentially threatened water supply well downgradient of the source. The groundwater is not considered a potential source of DW or is of limited beneficial use (IIIA, IIIB or perched aquifer).

(Place an "X" next to one below)

Identified: X

Potential - There is no potentially threatened water supply well downgradient of the source. The groundwater is potentially usable for DW, irrigation or agriculture, but not presently used (Class IIB aquifer).

Potential: _____

Limited: _____

Brief Rationale for Selection: Off-site supply wells down gradient.

Activity Name: WILLOW GROVE PA NAS

Site Name: SITE 00003

Groundwater Category: High
(High, Medium, Low)

Soil

CONTAMINANT
HAZARD
FACTOR (1)
(CHF)

Contaminant	Maximum Conc. mg/Kg	Standard mg/Kg	Ratio (2)
Manganese and compounds	1,780.0	3,100.0	0.570
Calcium	12,500.0	23,000.0	0.540
Arsenic (cancer endpoint)	8.6	21.0	0.410
Aluminum	16,100.0	75,000.0	0.210
Lead	40.5	400.0	0.100
Benzo[a]pyrene	0.45	5.6	0.080
Vanadium	33.6	520.0	0.060
Dieldrin	0.16	2.8	0.060
Barium and compounds	176.0	5,200.0	0.030
Nickel and compounds	13.2	1,500.0	0.010
Total:			2.131

(1) Evaluate for human contaminants only
 (2) Ratio = Maximum Concentration/Standard
 Note: Only top ten contaminants are displayed.

(Place an "X" next to one below)

Significant (If Total > 100):

Moderate (If Total 2 - 100):

Minimal (If Total < 2):

X

MIGRATION
PATHWAY
FACTOR
(MPF)

Evident -

Analytical data or observable evidence indicates that contamination is present at, is moving towards, or has moved to a point of exposure

Confined - Low possibility for contamination to be present at or migrate to a point of exposure

(Place an "X" next to one below)

Evident:

Potential:

Confined:

X

Brief Rationale for Selection: Soil contamination present but not migrating.

RECEPTOR
FACTOR
(RF)

Identified -

Receptors identified that have access to contaminated soil

Limited - Little or no potential for receptors to have access to contaminated soil

(Place an "X" next to one below)

Identified:

Potential:

Limited:

X

Brief Rationale for Selection: On-site workers.

Activity Name: WILLOW GROVE PA NASSite Name: SITE 00003Soil Category: High
(High, Medium, Low)

Surface Water Human

CONTAMINANT HAZARD FACTOR (1) (CHF)

Contaminant	Maximum Conc. ug/L	Standard ug/L	Ratio (2)
Antimony and compounds	64.0	15.0	4.270
Lead	9.6	4.0	2.400
Calcium	19,100.0	11,000.0	1.740
Manganese and compounds	1,550.0	1,700.0	0.910
Beryllium and compounds	5.0	73.0	0.070
Barium and compounds	99.0	2,600.0	0.040
Aluminum	1,030.0	37,000.0	0.030
Nickel and compounds	12.0	730.0	0.020
Copper and compounds	9.0	1,400.0	0.010
Bis(2-ethylhexyl)phthalate (DEHP)	1.0	480.0	
Total:			9.476

(1). Evaluate for human contaminants only
(2) Ratio = Maximum Concentration/Standard
Note: Only top ten contaminants are displayed.

(Place an "X" next to one below)

Significant (If Total > 100): _____

Moderate (If Total 2 - 100): X

Minimal (If Total < 2): _____

MIGRATION PATHWAY FACTOR (MPF)

Evident - Analytical data or observable evidence indicates that contamination in the media is present at, is moving toward, or has moved to a point of exposure

Potential - Possibility for contamination to be present at or migrate to a point of exposure; or information is not sufficient to make a determination of Evident or Confined

Confined - Information indicates a low potential for contamination to a potential point of exposure (could be due to the presence of geological structures or physical controls)

(Place an "X" next to one below)

Evident: X

Potential: _____

Confined: _____

Brief Rationale for Selection: Surface water contamination confirmed.

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to surface water

Potential - Potential for receptors to have access to surface water

Limited - Little or no potential for receptors to have access to surface water

(Place an "X" next to one below)

Identified: X

Potential: _____

Limited: _____

Brief Rationale for Selection: On-site workers.

Activity Name: WILLOW GROVE PA NAS

Site Name: SITE 00003

Surface Water Human Category: High
(High, Medium, Low)

Surface Water Eco Fresh

**CONTAMINANT
HAZARD
FACTOR (1)
(CHF)**

Contaminant	Maximum Conc. ug/L	Standard ug/L	Ratio (2)
Calcium	19,100.0	110.0	173.640
Lead	9.6	3.2	3.000
Antimony and compounds	64.0	30.0	2.130
Beryllium and compounds	5.0	5.3	0.940
Copper and compounds	9.0	12.0	0.750
Zinc	17.0	110.0	0.150
Nickel and compounds	12.0	160.0	0.080
Bis(2-ethylhexyl)phthalate (DEHP)	1.0	360.0	
Barium and compounds	99.0		
Manganese and compounds	1,550.0		
Total:			180.695

(1) Evaluate for human contaminants only
(2) Ratio = Maximum Concentration/Standard
Note: Only top ten contaminants are displayed.

(Place an "X" next to one below)

Significant (If Total > 100): X

Moderate (If Total 2 - 100):

Minimal (If Total < 2):

**MIGRATION
PATHWAY
FACTOR
(MPF)**

Evident - Analytical data or observable evidence indicates that contamination in the media is present at, is moving toward, or has moved to a point of exposure

Potential - Possibility for contamination to be present at or migrate to a point of exposure; or information is not sufficient to make a determination of Evident or Confined

Confined - Information indicates a low potential for contamination to a potential point of exposure (could be due to the presence of geological structures or physical controls)

(Place an "X" next to one below)

Evident: X

Potential:

Confined:

Brief Rationale for Selection: Analytical data indicates that contamination in this media is moving toward a point of exposure.

**RECEPTOR
FACTOR
(RF)**

Identified - Receptors identified that have access to surface water

Potential - Potential for receptors to have access to surface water

Limited - Little or no potential for receptors to have access to surface water

(Place an "X" next to one below)

Identified: X

Potential:

Limited:

Brief Rationale for Selection: Receptors are identified that have access to surface water which is contaminated.

Activity Name: WILLOW GROVE PA NAS

Site Name: SITE 00003

Surface Water Fresh Category: High
(High, Medium, Low)

Sediment Human

CONTAMINANT
HAZARD
FACTOR (1)
(CHF)

Contaminant	Maximum Conc. mg/Kg	Standard mg/Kg	Ratio (2)
Calcium	34,800.0	23,000.0	1.510
Benzo[a]pyrene	8.0	5.6	1.430
Lead	279.0	400.0	0.700
Aluminum	30,900.0	75,000.0	0.410
Cadmium and compounds	10.3	37.0	0.280
Arsenic (cancer endpoint)	5.4	21.0	0.260
Benzo[b]fluoranthene	10.0	56.0	0.180
Barium and compounds	868.0	5,200.0	0.170
Manganese and compounds	501.0	3,100.0	0.160
Vanadium	61.2	520.0	0.120
Total:			5.618

(1) Evaluate for human contaminants only
 (2) Ratio = Maximum Concentration/Standard
 Note: Only top ten contaminants are displayed.

(Place an "X" next to one below)

Significant (If Total > 100): _____

Moderate (If Total 2 - 100): X

Minimal (If Total < 2): _____

MIGRATION
PATHWAY
FACTOR
(MPF)

Evident -

Analytical data or observable evidence indicates that contamination in the media is present at, is moving toward, or has moved to a point of exposure

Confined -

Information indicates a low potential for contamination to a potential point of exposure (could be due to the presence of geological structures or or physical controls)

(Place an "X" next to one below)

Evident: _____

Potential: X

Confined: _____

Potential -

Possibility for contamination to be present at or migrate to a point of exposure; or information is not sufficient to make a determination of Evident or Confined

Brief Rationale for Selection: Contamination has moved only slightly beyond the source.

RECEPTOR
FACTOR
(RF)

Identified -

Receptors identified that have access to sediment

Limited - Little or no potential for receptors to have access to sediment

(Place an "X" next to one below)

Identified: X

Potential: _____

Limited: _____

Potential -

Potential for receptors to have access to sediment

Brief Rationale for Selection: Receptors identified that have access to sediments which have contamination.

Activity Name: WILLOW GROVE PA NASSite Name: SITE 00003Sediment Human Category: High
(High, Medium, Low)

RELATIVE RISK EVALUATION WORKSHEET

SITE (1) BACKGROUND INFORMATION

Installation/Site Name for FUDS: <u>WILLOW GROVE PA NAS</u>	Date Entered (Day, Month, Year): <u>10/28/96</u>
Location (State): <u>PA</u>	Media Evaluated (GW, SW, Sediment, Soil): <u>SOIL</u>
Site (Name/RMIS ID) / Project for FUDS: <u>SITE 00004</u>	Phase of Exec. (SI, RI, FS, Remv, RD/RA, or equiv. RCRA Stage): <u>NFA</u>
RMIS Site Type: <u>LANDFILL</u>	Agr. Status (Y/N, If yes, type of agreement e.g., FFA, Permit, Order): <u>No</u>
Point of Contact (Name/Phone): <u>JIM EDMOND</u>	National Priority List (Y/N): <u>Yes</u> Site Rank: <u>Low</u>

SITE SUMMARY

(Include only key elements of information used to conduct the relative risk site evaluation. Attach map view of site if desired.)

Brief Site Description (Include site type, materials disposed of, dates of operation, and other relevant information):

Brief Description of Pathways (Groundwater, Surface Water, Sediment, Soil):

Brief Description of Receptors (Human and Ecological):

(1) Use to record information on Sites and Areas of Concern (AOC) for Relative Risk Site Evaluation. The term Site is defined as a discrete area for which suspected contamination has been verified and requires A Site by definition has been, or will be, entered into RMIS. For the FUDS Program, "projects" equates to sites for current installations. An AOC is a discrete area of contamination, or suspected contamination in (or RFA) phase that has not been entered into RMIS.

RELATIVE RISK EVALUATION WORKSHEET

SITE (1) BACKGROUND INFORMATION

Installation/Site Name for FUDS: WILLOW GROVE PA NAS
 Location (State): PA
 Site (Name/RMIS ID) / Project for FUDS: SITE 00005
 RMIS Site Type: FIRE/CRASH TRAINING AREA
 Point of Contact (Name/Phone): JIM EDMOND

Date Entered (Day, Month, Year): 4/14/95
 Media Evaluated (GW, SW, Sediment, Soil): GW
 Phase of Exec. (SI, RI, FS, Remv, RD/RA, or equiv. RCRA Stage): RI
 Agr. Status (Y/N, If yes, type of agreement e.g., FFA, Permit, Order): Yes
 National Priority List (Y/N): Yes Site Rank: High

SITE SUMMARY

(Include only key elements of information used to conduct the relative risk site evaluation. Attach map view of site if desired.)

Brief Site Description (Include site type, materials disposed of, dates of operation, and other relevant information):

The fire training area was used from 1942 until 1975 for large-scale firefighting exercises, which included the disposal and burning of flammable liquid wastes (solvents, paints, and various petroleum products.) The site is located in the south-central portion of the facility just south of Taxiway J. Chlorinated and non-chlorinated hydrocarbons were suspected to present in the ground water.

Brief Description of Pathways (Groundwater, Surface Water, Sediment, Soil):

Pathways to be considered at Site 5 include direct dermal contact with the surface and subsurface soils. There are no water supply wells in the area, therefore, groundwater is not considered to be a pathway.

Brief Description of Receptors (Human and Ecological):

Receptors to be considered at Site 5 include on site workers.

(1) Use to record information on Sites and Areas of Concern (AOC) for Relative Risk Site Evaluation. The term Site is defined as a discrete area for which suspected contamination has been verified and requires A Site by definition has been, or will be, entered into RMIS. For the FUDS Program, "projects" equates to sites for current installations. An AOC is a discrete area of contamination, or suspected contamination in (or RFA) phase that has not been entered into RMIS.

Ground Water

**CONTAMINANT
HAZARD
FACTOR (1)
(CHF)**

Contaminant	Maximum Conc. ug/L	Standard ug/L	Ratio (2)
Dichloroethylene, 1,1-	840.0	4.6	182.610
Trichloroethylene (TCE)	590.0	160.0	3.690
Dichloroethylene, 1,2- (mixture)	180.0	55.0	3.270
Dichloroethane, 1,1-	420.0	810.0	0.520
Benzene	16.0	39.0	0.410
Trichloroethane, 1,1,1-	260.0	790.0	0.330
Tetrachloroethylene (PCE)	8.0	110.0	0.070
Total:			190.900

(1) Evaluate for human contaminants only
(2) Ratio = Maximum Concentration/Standard
Note: Only top ten contaminants are displayed.

(Place an "X" next to one below)

Significant (If Total > 100): X

Moderate (If Total 2 - 100):

Minimal (If Total < 2):

**MIGRATION
PATHWAY
FACTOR
(MPF)**

Evident - Analytical data or observable evidence indicates that contamination in the media is moving away from the source:

Confined - Information indicates that the potential for contaminant migration from the source is limited (due to geological structures or physical controls)

(Place an "X" next to one below)

Evident: X

Potential - Possibility for contamination to be present at or migrate to a point of exposure; or information is not sufficient to make a determination of Evident or Confined

Potential:

Confined:

Brief Rationale for Selection: **GW contamination present.**

**RECEPTOR
FACTOR
(RF)**

Identified - There is a threatened or potentially threatened water supply downgradient of the source. The GW (cont. or not) is a current drinking water source or is equiv. to (Class I or IIA aquifer).

Limited - There is no potentially threatened water supply well downgradient of the source. The groundwater is not considered a potential source of DW or is of limited beneficial use (IIIA, IIIB or perched aquifer).

(Place an "X" next to one below)

Identified:

Potential - There is no potentially threatened water supply well downgradient of the source. The groundwater is potentially usable for DW, irrigation or agriculture, but not presently used (Class IIB aquifer).

Potential: X

Limited:

Brief Rationale for Selection: **No drinking water wells in area. Aquifer is a drinking water aquifer.**

Activity Name: WILLOW GROVE PA NAS

Site Name: SITE 00005

Groundwater Category: High
(High, Medium, Low)

Soil

**CONTAMINANT
HAZARD
FACTOR (1)
(CHF)**

Contaminant	Maximum Conc. mg/Kg	Standard mg/Kg	Ratio (2)
Toluene		520.0	
Total:			

(1) Evaluate for human contaminants only
 (2) Ratio = Maximum Concentration/Standard
 Note: Only top ten contaminants are displayed.

(Place an "X" next to one below)

Significant (If Total > 100): _____

Moderate (If Total 2 - 100): _____

Minimal (If Total < 2): _____

**MIGRATION
PATHWAY
FACTOR
(MPF)**

Evident - Analytical data or observable evidence indicates that contamination is present at, is moving towards, or has moved to a point of exposure

Confined - Low possibility for contamination to be present at or migrate to a point of exposure

(Place an "X" next to one below)

Potential - Possibility for contamination to be present at or migrate to a point of exposure; or information is not sufficient to make a determination of Evident or Confined

Evident: _____

Potential: X

Confined: _____

Brief Rationale for Selection: Soil contamination confirmed but not migrational.

**RECEPTOR
FACTOR
(RF)**

Identified - Receptors identified that have access to contaminated soil

Limited - Little or no potential for receptors to have access to contaminated soil

(Place an "X" next to one below)

Potential - Potential for receptors to have access to contaminated soil

Identified: X

Potential: _____

Limited: _____

Brief Rationale for Selection: On-site workers.

Activity Name: WILLOW GROVE PA NAS

Site Name: SITE 00005

Soil Category: NE
 (High, Medium, Low)

Soil

**CONTAMINANT
HAZARD
FACTOR (1)
(CHF)**

Contaminant	Maximum Conc. mg/Kg	Standard mg/Kg	Ratio (2)
Toluene		520.0	
Total:			

(1) Evaluate for human contaminants only
 (2) Ratio = Maximum Concentration/Standard
 Note: Only top ten contaminants are displayed.

(Place an "X" next to one below)

Significant (If Total > 100): _____

Moderate (If Total 2 - 100): _____

Minimal (If Total < 2): _____

**MIGRATION
PATHWAY
FACTOR
(MPF)**

Evident - Analytical data or observable evidence indicates that contamination is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination to be present at or migrate to a point of exposure; or information is not sufficient to make a determination of Evident or Confined

Confined - Low possibility for contamination to be present at or migrate to a point of exposure

(Place an "X" next to one below)

Evident: _____

Potential: _____ X _____

Confined: _____

Brief Rationale for Selection: Soil contamination confirmed but not migrational.

**RECEPTOR
FACTOR
(RF)**

Identified - Receptors identified that have access to contaminated soil

Potential - Potential for receptors to have access to contaminated soil

Limited - Little or no potential for receptors to have access to contaminated soil

(Place an "X" next to one below)

Identified: _____ X _____

Potential: _____

Limited: _____

Brief Rationale for Selection: On-site workers.

Activity Name: WILLOW GROVE PA NAS

Site Name: SITE 00005

Soil Category: NE
 (High, Medium, Low)

RELATIVE RISK EVALUATION WORKSHEET

SITE (1) BACKGROUND INFORMATION

Installation/Site Name for FUDS: WILLOW GROVE PA NAS

Date Entered (Day, Month, Year): 10/28/96

Location (State): PA

Media Evaluated (GW, SW, Sediment, Soil): SOIL

Site (Name/RMIS ID) / Project for FUDS: SITE 00006

Phase of Exec. (SI, RI, FS, Remv, RD/RA, or equiv. RCRA Stage): NFA

RMIS Site Type: FIRING RANGE

Agr. Status (Y/N, If yes, type of agreement e.g., FFA, Permit, Order): No

Point of Contact (Name/Phone): JIM EDMOND

National Priority List (Y/N): Yes Site Rank: Low

SITE SUMMARY

(Include only key elements of information used to conduct the relative risk site evaluation. Attach map view of site if desired.)

Brief Site Description (Include site type, materials disposed of, dates of operation, and other relevant information):

Brief Description of Pathways (Groundwater, Surface Water, Sediment, Soil):

Brief Description of Receptors (Human and Ecological):

(1) Use to record information on Sites and Areas of Concern (AOC) for Relative Risk Site Evaluation. The term Site is defined as a discrete area for which suspected contamination has been verified and requires A Site by definition has been, or will be, entered into RMIS. For the FUDS Program, "projects" equates to sites for current installations. An AOC is a discrete area of contamination, or suspected contamination in (or RFA) phase that has not been entered into RMIS.

RELATIVE RISK EVALUATION WORKSHEET

SITE (1) BACKGROUND INFORMATION

Installation/Site Name for FUDS: WILLOW GROVE PA NAS
Location (State): PA
Site (Name/RMIS ID) / Project for FUDS: SITE 00007
RMIS Site Type: FIRING RANGE
Point of Contact (Name/Phone): JIM EDMOND

Date Entered (Day, Month, Year): 10/28/96
Media Evaluated (GW, SW, Sediment, Soil): SOIL
Phase of Exec. (SI, RI, FS, Remv, RD/RA, or equiv. RCRA Stage): NFA
Agr. Status (Y/N, If yes, type of agreement e.g., FFA, Permit, Order): No
National Priority List (Y/N): Yes Site Rank: Low

SITE SUMMARY

(Include only key elements of information used to conduct the relative risk site evaluation. Attach map view of site if desired.)

Brief Site Description (Include site type, materials disposed of, dates of operation, and other relevant information):

Brief Description of Pathways (Groundwater, Surface Water, Sediment, Soil):

Brief Description of Receptors (Human and Ecological):

(1) Use to record information on Sites and Areas of Concern (AOC) for Relative Risk Site Evaluation. The term Site is defined as a discrete area for which suspected contamination has been verified and requires A Site by definition has been, or will be, entered into RMIS. For the FUDS Program, "projects" equates to sites for current installations. An AOC is a discrete area of contamination, or suspected contamination in (or RFA) phase that has not been entered into RMIS.

RELATIVE RISK EVALUATION WORKSHEET

SITE (1) BACKGROUND INFORMATION

Installation/Site Name for FUDS: WILLOW GROVE PA NAS

Date Entered (Day, Month, Year): 10/28/96

Location (State): PA

Media Evaluated (GW, SW, Sediment, Soil): SOIL

Site (Name/RMIS ID) / Project for FUDS: SITE 00008

Phase of Exec. (SI, RI, FS, Remv, RD/RA, or equiv. RCRA Stage): NFA

RMIS Site Type: SPILL SITE AREA

Agr. Status (Y/N, If yes, type of agreement e.g., FFA, Permit, Order): No

Point of Contact (Name/Phone): JIM EDMOND

National Priority List (Y/N): Yes Site Rank: Low

SITE SUMMARY

(Include only key elements of information used to conduct the relative risk site evaluation. Attach map view of site if desired.)

Brief Site Description (Include site type, materials disposed of, dates of operation, and other relevant information):

Brief Description of Pathways (Groundwater, Surface Water, Sediment, Soil):

Brief Description of Receptors (Human and Ecological):

(1) Use to record information on Sites and Areas of Concern (AOC) for Relative Risk Site Evaluation. The term Site is defined as a discrete area for which suspected contamination has been verified and requires A Site by definition has been, or will be, entered into RMIS. For the FUDS Program, "projects" equates to sites for current installations. An AOC is a discrete area of contamination, or suspected contamination in (or RFA) phase that has not been entered into RMIS.

RELATIVE RISK EVALUATION WORKSHEET

SITE (1) BACKGROUND INFORMATION

Installation/Site Name for FUDS: WILLOW GROVE PA NAS

Date Entered (Day, Month, Year): 10/28/96

Location (State): PA

Media Evaluated (GW, SW, Sediment, Soil): SOIL

Site (Name/RMIS ID) / Project for FUDS: SITE 00009

Phase of Exec. (SI, RI, FS, Remv, RD/RA, or equiv. RCRA Stage): NFA

RMIS Site Type: UNDERGROUND TANK FARM

Agr. Status (Y/N, If yes, type of agreement e.g., FFA, Permit, Order): No

Point of Contact (Name/Phone): JIM EDMOND

National Priority List (Y/N): No Site Rank: Low

SITE SUMMARY

(Include only key elements of information used to conduct the relative risk site evaluation. Attach map view of site if desired.)

Brief Site Description (Include site type, materials disposed of, dates of operation, and other relevant information):

Brief Description of Pathways (Groundwater, Surface Water, Sediment, Soil):

Brief Description of Receptors (Human and Ecological):

(1) Use to record information on Sites and Areas of Concern (AOC) for Relative Risk Site Evaluation. The term Site is defined as a discrete area for which suspected contamination has been verified and requires A Site by definition has been, or will be, entered into RMIS. For the FUDS Program, "projects" equates to sites for current installations. An AOC is a discrete area of contamination, or suspected contamination in (or RFA) phase that has not been entered into RMIS.

RELATIVE RISK EVALUATION WORKSHEET

SITE (1) BACKGROUND INFORMATION

Installation/Site Name for FUDS: WILLOW GROVE PA NAS

Date Entered (Day, Month, Year): 10/28/96

Location (State): PA

Media Evaluated (GW, SW, Sediment, Soil): SOIL

Site (Name/RMIS ID) / Project for FUDS: SITE 00009

Phase of Exec. (SI, RI, FS, Remv, RD/RA, or equiv. RCRA Stage): NFA

RMIS Site Type: UNDERGROUND TANK FARM

Agr. Status (Y/N, If yes, type of agreement e.g., FFA, Permit, Order): No

Point of Contact (Name/Phone): JIM EDMOND

National Priority List (Y/N): No Site Rank: Low

SITE SUMMARY

(Include only key elements of information used to conduct the relative risk site evaluation. Attach map view of site if desired.)

Brief Site Description (Include site type, materials disposed of, dates of operation, and other relevant information):

Brief Description of Pathways (Groundwater, Surface Water, Sediment, Soil):

Brief Description of Receptors (Human and Ecological):

(1) Use to record information on Sites and Areas of Concern (AOC) for Relative Risk Site Evaluation. The term Site is defined as a discrete area for which suspected contamination has been verified and requires A Site by definition has been, or will be, entered into RMIS. For the FUDS Program, "projects" equates to sites for current installations. An AOC is a discrete area of contamination, or suspected contamination in (or RFA) phase that has not been entered into RMIS.

RELATIVE RISK EVALUATION WORKSHEET

SITE (1) BACKGROUND INFORMATION

Installation/Site Name for FUDS: <u>WILLOW GROVE PA NAS</u>	Date Entered (Day, Month, Year): <u>10/22/97</u>
Location (State): <u>PA</u>	Media Evaluated (GW, SW, Sediment, Soil): <u>GW SOIL</u>
Site (Name/RMIS ID) / Project for FUDS: <u>SITE 00010</u>	Phase of Exec. (SI, RI, FS, Remv, RD/RA, or equiv. RCRA Stage): <u>CERCLA IRA</u>
RMIS Site Type: <u>UNDERGROUND TANK FARM</u>	Agr. Status (Y/N, If yes, type of agreement e.g., FFA, Permit, Order): <u>Yes</u>
Point of Contact (Name/Phone): <u>JIM EDMOND</u>	National Priority List (Y/N): <u>Yes</u> Site Rank: <u>Med</u>

SITE SUMMARY

(Include only key elements of information used to conduct the relative risk site evaluation. Attach map view of site if desired.)

Brief Site Description (Include site type, materials disposed of, dates of operation, and other relevant information):

The Navy Fuel Farm is approximately 2 acres in size and is located north of the intersection of Privet Road and the aircraft parking apron off runway 15. During 1991 a new fuel farm was constructed at the site of the old fuel farm. The new fuel farm was to use new above ground fuel storage tanks. This required the removal of two 210,000 gallon JP-4/JP-5 fuel tanks along with a 500 gallon waste oil tank. The soils which were excavated as part of the tank removal along with soils excavated as part of the new construction were tested and piled adjacent to the new fuel farm site.

Brief Description of Pathways (Groundwater, Surface Water, Sediment, Soil):

Pathways to be considered at Site 10 include direct dermal contact with the surface and subsurface soils. The base potable water supply wells are located down gradient of this site therefore, groundwater is considered to be a pathway.

Brief Description of Receptors (Human and Ecological):

Receptors to be considered at Site 10 include current on site workers.

(1) Use to record information on Sites and Areas of Concern (AOC) for Relative Risk Site Evaluation. The term Site is defined as a discrete area for which suspected contamination has been verified and requires A Site by definition has been, or will be, entered into RMIS. For the FUDS Program, "projects" equates to sites for current installations. An AOC is a discrete area of contamination, or suspected contamination in (or RFA) phase that has not been entered into RMIS.

Ground Water

**CONTAMINANT
HAZARD
FACTOR (1)
(CHF)**

Contaminant	Maximum Conc. ug/L	Standard ug/L	Ratio (2)
Benzene	567.94	39.0	14.560
Acetone	1,907.5	610.0	3.130
Methyl ethyl ketone	2,862.2	1,900.0	1.510
Xylene (mixed)	1,822.4	1,400.0	1.300
Ethyl benzene	652.83	1,300.0	0.500
Methylene chloride	108.33	430.0	0.250
Chlorobenzene	5.0	39.0	0.130
Trichloroethylene (TCE)	10.85	160.0	0.070
Toluene	17.0	720.0	0.020
Carbon disulfide	17.0	1,000.0	0.020
Total:			21.488

(1) Evaluate for human contaminants only
 (2) Ratio = Maximum Concentration/Standard
 Note: Only top ten contaminants are displayed.

(Place an "X" next to one below)

Significant (If Total > 100): _____

Moderate (If Total 2 - 100): X

Minimal (If Total < 2): _____

**MIGRATION
PATHWAY
FACTOR
(MPF)**

Evident - Analytical data or observable evidence indicates that contamination in the media is moving away from the source.

Confined - Information indicates that the potential for contaminant migration from the source is limited (due to geological structures or physical controls)

(Place an "X" next to one below)

Evident: X

Potential - Possibility for contamination to be present at or migrate to a point of exposure; or information is not sufficient to make a determination of Evident or Confined

Potential: _____

Confined: _____

Brief Rationale for Selection: Contamination has moved away from the source area.

**RECEPTOR
FACTOR
(RF)**

Identified - There is a threatened or potentially threatened water supply downgradient of the source. The GW (cont. or not) is a current drinking water source or is equiv. to (Class I or IIA aquifer).

Limited - There is no potentially threatened water supply well downgradient of the source. The groundwater is not considered a potential source of DW or is of limited beneficial use (IIIA, IIIB or perched aquifer).

(Place an "X" next to one below)

Identified: _____

Potential - There is no potentially threatened water supply well downgradient of the source. The groundwater is potentially usable for DW, irrigation or agriculture, but not presently used (Class IIB aquifer).

Potential: _____

Limited: X

Brief Rationale for Selection: There is no potentially threatened water supply down gradient of the source.

Activity Name: WILLOW GROVE PA NAS

Site Name: SITE 00010

Groundwater Category: Med
 (High, Medium, Low)

Soil

**CONTAMINANT
HAZARD
FACTOR (1)
(CHF)**

Contaminant	Maximum Conc. mg/Kg	Standard mg/Kg	Ratio (2)
Naphthalene	0.95	55.0	0.020
Methylene chloride	2.3	850.0	
Xylene (mixed)	1.5	990.0	
Ethyl benzene	0.16	230.0	
Toluene	0.08	520.0	
Bis(2-ethylhexyl)phthalate (DEHP)	0.49	3,200.0	
Acetone	0.19	1,400.0	
Methyl isobutyl ketone	0.03	750.0	
Methyl ethyl ketone	0.09	6,900.0	
Total:			0.023

(1) Evaluate for human contaminants only
(2) Ratio = Maximum Concentration/Standard
Note: Only top ten contaminants are displayed.

(Place an "X" next to one below)

Significant (If Total > 100): _____

Moderate (If Total 2 - 100): _____

Minimal (If Total < 2): X

**MIGRATION
PATHWAY
FACTOR
(MPF)**

Evident - Analytical data or observable evidence indicates that contamination is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination to be present at or migrate to a point of exposure; or information is not sufficient to make a determination of Evident or Confined

Confined - Low possibility for contamination to be present at or migrate to a point of exposure

(Place an "X" next to one below)

Evident: _____

Potential: _____

Confined: X

Brief Rationale for Selection:

**RECEPTOR
FACTOR
(RF)**

Identified - Receptors identified that have access to contaminated soil

Potential - Potential for receptors to have access to contaminated soil

Limited - Little or no potential for receptors to have access to contaminated soil

(Place an "X" next to one below)

Identified: _____

Potential: _____

Limited: X

Brief Rationale for Selection:

Activity Name: WILLOW GROVE PA NAS

Site Name: SITE 00010

Soil Category: Low
(High, Medium, Low)

RELATIVE RISK EVALUATION WORKSHEET

SITE (1) BACKGROUND INFORMATION

Installation/Site Name for FUDS: WILLOW GROVE PA NAS

Date Entered (Day, Month, Year): 3/22/00

Location (State): PA

Media Evaluated (GW, SW, Sediment, Soil): SOIL

Site (Name/RMIS ID) / Project for FUDS: SITE 00011

Phase of Exec. (SI, RI, FS, Remv, RD/RA, or equiv. RCRA Stage): RI

RMIS Site Type: SPILL SITE AREA

Agr. Status (Y/N, If yes, type of agreement e.g., FFA, Permit, Order): Yes

Point of Contact (Name/Phone): JIM EDMOND

National Priority List (Y/N): Yes Site Rank: Low

SITE SUMMARY

(Include only key elements of information used to conduct the relative risk site evaluation. Attach map view of site if desired.)

Brief Site Description (Include site type, materials disposed of, dates of operation, and other relevant information):

During October 1992, a construction contractor under contract to NAS Willow Grove, was placing storm sewer and concrete culvert in the area between the Air Force and Navy aircraft parking aprons. However, during construction, the contractor noticed volatile odors emanating from the soils and suspected the presence of some type of contamination. Upon inspection of the project site, no visible soil sampling of the soils for TPH and BTEX was performed by Analytical Laboratories, Inc. Their results concluded that the soil was contaminated with petroleum hydrocarbons and BTEX compounds at various concentrations.

Brief Description of Pathways (Groundwater, Surface Water, Sediment, Soil):

Pathways to be considered at Site 11 include direct dermal contact with the surface and subsurface soils. Ground water has not been investigated as of yet and therefore can not be considered a potential pathway.

Brief Description of Receptors (Human and Ecological):

Receptors to be considered at Site 11 include current on site workers.

(1) Use to record information on Sites and Areas of Concern (AOC) for Relative Risk Site Evaluation. The term Site is defined as a discrete area for which suspected contamination has been verified and requires A Site by definition has been, or will be, entered into RMIS. For the FUDS Program, "projects" equates to sites for current installations. An AOC is a discrete area of contamination, or suspected contamination in (or RFA) phase that has not been entered into RMIS.

Soil

CONTAMINANT
HAZARD
FACTOR (1)
(CHF)

Contaminant	Maximum Conc. mg/Kg	Standard mg/Kg	Ratio (2)
Ethyl benzene	40.5	230.0	0.180
Toluene	6.3	520.0	0.010
Xylene (mixed)	10.8	990.0	0.010
(1) Evaluate for human contaminants only		Total:	0.199
(2) Ratio = Maximum Concentration/Standard			

(Place an "X" next to one below)

Significant (If Total > 100):

Moderate (If Total 2 - 100):

Minimal (If Total < 2): X

**MIGRATION
PATHWAY
FACTOR
(MPF)**

Evident - Analytical data or observable evidence indicates that contamination is present at, is moving towards, or has moved to a point of exposure

Confined - Low possibility for contamination to be present at or migrate to a point of exposure

(Place an "X" next to one below)

Evident:

Potential - Possibility for contamination to be present at or migrate to a point of exposure; or information is not sufficient to make a determination of Evident or Confined

Potential: \cdot \cdot X

Confined:

Brief Rationale for Selection: Soil contamination confirmed but not migrating.

RECEPTOR
FACTOR
(RF)

Identified - Receptors identified that have access to contaminated soil

Limited - Little or no potential for receptors to have access to contaminated soil

(Place an "X" next to one below)

Identified:

Potential - Potential for receptors to have access to contaminated soil

Potential: X

Limited:

Brief Rationale for Selection: On-Site workers.

Activity Name: WILLOW GROVE PA NAS

Site Name: SITE 00011

Soil Category: Low
(High, Medium, Low)

Ground Water

CONTAMINANT HAZARD FACTOR (1) (CHF)

Contaminant	Maximum Conc. ug/L	Standard ug/L	Ratio (2)
Total:			

(1) Evaluate for human contaminants only
(2) Ratio = Maximum Concentration/Standard
Note: Only top ten contaminants are displayed.

(Place an "X" next to one below)

Significant (If Total > 100): _____

Moderate (If Total 2 - 100): _____

Minimal (If Total < 2): _____

MIGRATION PATHWAY FACTOR (MPF)

Evident - Analytical data or observable evidence indicates that contamination in the media is moving away from the source.

Confined - Information indicates that the potential for contaminant migration from the source is limited (due to geological structures or physical controls)

Potential - Possibility for contamination to be present at or migrate to a point of exposure; or information is not sufficient to make a determination of Evident or Confined

(Place an "X" next to one below)

Evident: _____

Potential: X

Confined: _____

Brief Rationale for Selection: No Gw samples taken t yet. Soil is contaminated.

RECEPTOR FACTOR (RF)

Identified - There is a threatened or potentially threatened water supply downgradient of the source. The GW (cont. or not) is a current drinking water source or is equiv. to (Class I or IIA aquifer).

Limited - There is no potentially threatened water supply well downgradient of the source. The groundwater is not considered a potential source of DW or is of limited beneficial use (IIIA, IIIB or perched aquifer).

Potential - There is no potentially threatened water supply well downgradient of the source. The groundwater is potentially usable for DW, irrigation or agriculture, but not presently used (Class IIB aquifer).

(Place an "X" next to one below)

Identified: _____

Potential: X

Limited: _____

Brief Rationale for Selection: No supply in area- aquifer is for drinking.

Activity Name: WILLOW GROVE PA NAS

Site Name: SITE 00011

Groundwater Category: NE
(High, Medium, Low)